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Herausgeber:
Jürke Grau · Dietrich Podlech

Band 3 München 1996

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A new species and a synonym in Chenopodiaceae from Iran

H. AKHANI

Abstract:
AKHANI, H.: A new species and a synonym in Chenopodiaceae from Iran. – Sendtnera 3: 5–10. 1996. – ISSN 0944–0178.

Salsola zehzadi Akhani is described as a new species from the gypsum hills of E Iran in the Khorasan province. The newly described species *Halotis pedunculata* Assadi is reduced to synonymy of *Halimocnemis purpurea* Moq. Difficulties on the taxonomic ambiguity of the latter are disscused and a description and distribution map are given.

Zusammenfassung:
Salsola zehzadi Akhani wird als eine neue Art von Gipshügeln aus dem Osten Irans in der Provinz Khorasan beschrieben, die kürzlich beschriebene Art *Halotis pedunculata* Assadi in die Synonymie von *Halimocnemis purpurea* Moq. gestellt. Schwierigkeiten der taxonomischen Stellung von *Halimocnemis purpurea* werden diskutiert, sowie eine Beschreibung und Vorbereitungskarte angegeben.

Introduction

The family *Chenopodiaceae* is one of the most critical families of the Iranian flora. The account of this family in Flora Iranica was finished four years ago, however, due to technical problems it has not yet been published. A look to the proofs of the accounts of *Salsola*, *Halanthium* and *Halimocnemis* in the Flora Iranica leads me to describe a new *Salsola* and discuss the taxonomic ambiguity of *Halimocnemis purpurea* Moq.

A new *Salsola*

During my visit to Mashhad University Herbarium in January 1991 a characteristic *Salsola* species was found there. Further studies in the field and study of a lot of materials in Iran and the specimens studied for Flora Iranica in Kassel proved its novelty. The species is named after and in honour to Mr. B. Zehzad, my first teacher of Botany (Shahid Beheshti University, Tehran).

Salsola zehzadi Akhani, **sp. nov**.

Holotype: Khorasan: E of Torbat-e Jam, between Mohammad-abad and Malu, 22.10. 1991, 700 m, *Faghihnia & Zangui, 21222* (Hb. AKHANI!, Iso: M!, Mashhad University Herbarium!).

Species et sectione *Belanthera* Iljin, differt a *S. tomentosa* (Moq.) Spach habitu majore, apice tepalorum excepta glaberrima, foliis majoribus, fasciculatis, atroviridibus, succulentis.

Dwarf subshrub, 30–60 cm tall, much branched at the woody base, except the upper parts of the tepals completely glabrous, even in young state; stems ascending, erect, like the branches white, shining; lower branches robust and straight, inflorescence branches oblique. Leaves very fleshy, dark green, terete, linear, with a fasciulate arrangement of 3–5; outer leaves of the lower cauline parts 10–20 × 2–3 mm, slightly curved towards the axis, obtuse in living state, changing acute after drying; inner leaves 1/3 to 2/3 as long as the outer ones. Bracts terete to semiterete, shorter than leaves, as long as or slightly longer than the perianths. Bracteoles 5–6 × 2 mm, widened at the base, with hyaline margin, connate to each other at base, obtuse. Flowering tepals membranaceous, 3–3.7 mm long, 1–1.4 mm broad, 3-veined, apex obtuse, indistinctly lobed; transversal line at 1/3 of the lenght; above the line with a tuft of multicellular hairs 1.2–1.5 mm long. Fruiting perianths including wings 7–10 mm in diameter, pale yellow to pale pink, the older ones becomming black in the lower part; tepals above the wing forming a cone, covered by a tuft of whitish hairs. Stigma 2, 0.8 mm, papilose in the middle, naked at the apex. Filaments 3–3.2 mm long, inserted near the base of tepals, without staminal disk. Thecae 1.5 mm long, divided up to the appendage, appendage 1.1 mm long, triangular, acute.

Specimens seen:

Iran. Khorasan: E of Torbat-e Jam, between Mohammad-abad and Malu, 22.10.1991, 700 m, *Faghihnia & Zangui, 21222* "fruiting specimen" (M, Mashhad University Herbarium, hb. AKHANI). – c. 37 km E of Torbat-e Jam, 9 km after Mohammad-abad towards Malu, gypsum hills, 750–760 m, 15.8.1994, *Akhani & Zangui 10029* "flowering specimen" (M, hb. AKHANI) – c. 38 km E of Torbat-e Jam,11 km after Mohammad-abad towards Malu, gypsum hills, 720–740 m, 15.8.1994, *Akhani & Zangui 10035* " (M, hb. AKHANI).

This species more likely belongs to the sect. *Belanthera* Iljin, however, none of the members of this section are completely glabrous. Moreover this species can be distinguished from other related ones by its fasciculate leave arrangement and dark green leave colour. The very fleshy leaves are also peculiar, so the species looks like a *Suaeda* in life. It is likely to be closely related to *Salsola tomentosa* (Moq.) Spach. This latter is a very variable species widely distributed in Iranian deserts and semi-deserts. Despite of its highly variable range in respect to the indumentum and habit, it is never completely glabrous in the young state and the leaves are semiterete, not or only slightly fleshy and without a fasciculate arrangement. The collected *S. tomentosa* from the same locality (*Akhani 10043*, M, hb. AKHANI) has a lower growth habit, withish tomentose indument and not fleshy leaves. In the subglabrous populations of *S. tomentosa* there is always a correlation between glabrescens of the vegetative parts and the perianth. In *S. zehzadi* on the other hand, the glabrous nature of the vegetative parts and the hairy perianth are not correlated. Its fleshy leaves, habit and even its ecology show some similarities with *S. aucheri* (Moq.) Iljin, however it can be distinguished from this by its glabrous habit, dark green colour (not glaucous), shorter and not carinate bracts and bracteoles and by the fact that it does

not have a fasciculate leaf arrangement. The leave arrangement of this species is similar to *S. abarghuensis* Assadi (ASSADI 1984: 136), but in other characters it is totally different.

Distribution and ecology:

On the basis of our present knowledge *S. zehzadi* is confined to the gypsum hills east of Torbat-e Jam in the Khorasan province along the Afghanistan frontier. Its occurence in Afghanistan is to be expected (see map 1). The species grows in the gypsum hills in an area about 4 km long, where it is the main component of the vegetation. Associated species are: *Atraphaxis spinosa*, *Limonium sogdianum*, *Ephedra intermedia, Artemisia cf. turanica* and *Salsola tomentosa*. The vegetation is that of a very dry climate.

What is Halanthium purpureum?

During a joint Chenopod expedition with Mr. M. Assadi in 1987 we collected an interesting species from South Iran between Bastak and Bandar-e Lengeh. Two years later I found the same plant in the Southwest of the Iran, in the lowlands of the Ilam province. With the help of an illustration given for *Physogeton acanthophyllus* Jaub. & Spach in Ill. Pl. Or. 2: 48, tab. 135, 1846, I concluded that these gatherings with a characteristically large and vesicular purplish anther appendage could be the same as the illustrated plant by Jaubert & Spach. But because of the long distance and different phytogeographical area of our gathering from the Southern Iran and the type locality of *Physogeton acanthophyllus* (or its validly published older name *Halimocnemis purpurea* Moq.) in Western Iran we had doubts about their identity.

In 1990, I had the possibility to study the type of this species in Paris. Despite of the young and sturdy state of the type, the characteristic large and vesicular anther appendage is peculiar. The purplish colour of the appendage disappeared over time. On the same lable there are three generic names: *Physogeton*, *Halanthium* & *Halimocnemis*. In autumn 1992, I made another expedition to the Ilam province and collected fruiting specimens. Field observations and the collected fruiting material showed clearly, that the perianth segments are wingless. Therefore it belongs to the genus *Halimocnemis* and not to *Halanthium*. In 1993, I discussed the problem with Prof. H. Freitag and he kindly gave me a copy of the unpublished accounts of the genera *Halanthium* and *Halimocnemis* of the Flora Iranica written by I.C. Hedge. HEDGE (in press) followed Bunge's and Boissier's opinion and placed this species under *Halanthium* with this note: "I find this one of the most problematic of all our species, and even after studying type material and quite a wide range of other specimens, I do not feel confident about the description or correctness of all the identifications". At the same time ASSADI (1992: 60) published a new *Halotis pedunculata* on the basis of our own earlier collection in 1987. In my opinion MOQUIN (1840: 153) has correctly described the species under the genus *Halimocnemis*.

Another problematic matter in this species is its type locality in the West of Iran with a different phytogeography. Attempts to rediscover it in type locality have failed. The problem could be interpreted due to wrong or mixed label. We have discussed another example of such ambiguity in Aucher's collection for *Heliotropium aucheri* Moq. (see AKHANI & FÖRTHER 1994: 200).

Halimocnemis purpurea Moq., Chenopod. Monogr. 153 .1840 ≡ *Physogeton acanthophyllus* Jaub. & Spach. Ill. Pl. Or. 2: 48, tab. 135, 1846. ≡ *Physogeton purpureus* (Jaub. & Spach) Moq., in DC., Prodr. 13, 2: 202, 1849 ≡ *Halanthium purpureum* (Moq.) Bunge, Mém. Acad. Imp. Sc. Pétersb. 7 sér., 4, 11: 85, 1862 ≡ *Halogeton purpureus* Fenzl in Ledeb., Fl. Ross. 3: 833, 1851 in nota. **Type**: Persia, [? prope Hamadan], *Aucher-Eloy 2777* (P!, G-DC: microfish in M!).
= *Halotis pedunculata* Assadi, Iran. J. Bot. 5(2): 60, 1992 (1993). Holotype: Hormozgan: 8 km from Bastak to Bandar-e Lengeh, 800 m, 30.11.1987, *Assadi & Akhani 61930* (TARI!).

Fig.: JAUBERT & SPACH l.c. (under *Physogeton acanthophyllus*); ASSADI l.c. 61: fig. 2 (under *Halotis pedunculata*).

Annual, prostrate to ascending, 15–50 cm high, woody and much branched at the base, glaucous green, stem perpendiculary branched from base to apex; lower epiderm whitish, sometimes tinged in branching parts; pubescent with short patent to semiappressed upward hairs 0.1–0.3 mm long; margin of leaves and bracts with few long spreading hairs, 2–5 mm long. Leaves linear, 2–5 cm long, 2–3 mm broad, semiterete, canaliculate after drying, pubescent, lower margin with long hairs up to 5 mm, pointed at apex. Bracts (floral leaves) 1–2 cm, recurved, hardened and indurated at base, semiamplexicaule, carinate on the back, widened at the base, hyaline at margin. Bracteoles as long as perianth. All branches even the lowermost bearing flowers. Perianth segments 5, oblong-lanceolate, membranaceous, 8–10 mm long, 2–3 mm broad in fruiting time, hardened in lower 1/2 to 2/3, pubescent on the back, at the middle with a small transversal outgrowth, obtuse and indistinctly lobed at the apex. Filaments c. 6 mm long, 0.7 mm broad; thecae 2 mm long, divided nearly to the appendage; appendage obovate, nearly sessile. Style 1 mm long. Stigma subulate, c. 3 mm long, papillose at apex.

Specimens seen:

Iran. Khuzestan: Inter Seytun et Behbehan, *Haussknecht* (P). – Ilam: ca. 25–28 km N of Mehran, Konjancham river margin, c. 300 m, 16.10.1992, *Akhani 9036* (M, hb. AKHANI) – ca. 45 km from Mehran towards Dehloran, Changooleh river margin, ca. 300 m, 16.10.1993, *Akhani 9043* (M, hb. AKHANI) – ca. 15 km NE of Mehran, Konjancham river bed, ca. 350 m, 3.8.1989, *Akhani 5448* (KAS, MMTT). – Hormozgan: 8 km from Bastak to Bandar-e Lengeh, 800 m, 30.11.1987, *Assadi & Akhani 61930* (TARI). – not exactly to localize: Persia. [? prope Hamadan], *Aucher-Eloy 2777* (P). – Other materials given by ASSADI (1992): Hormozgan: 170 km from Bandar Abbas to Lar, 450 m, *Foroughi & Assadi 15064* (TARI). – Bushehr: 15 km NW of Ganaveh, 30 m, *Bokhari et al. 14803* (TARI).

Distribution and ecology:

Based on the material cited above *Halimocnemis purpurea* has a wide distribution in the South and Southwest of the Iran from the Hormozgan to the Ilam province (see map. 1). The occurence of this species near the frontier of the Iraq suggests that this species more likely could be found in similar habitats in the Iraq. Phytogeographically it seems to be an Irano-Sindian element, a subdivision of Saharo-Sindian regional zone (see LÉONARD 1989). The habitat of this plant in the lowlands of the Ilam province is the margin of rivers (Konjancham and Changooleh rivers) on sandy-gravelly and disturbed soils, surrounded by gypsum hills. The associated species are: *Carthamus oxyacantha*, *Amaranthus albus*, *Heliotropium crassifolium*, *H. noeanum*, *H. suaveolens* and *H. europeum* s.l.

Acknowledgment

I am indebted to Prof. Dr. H. Freitag (Kassel) who gave me a copy of his unpublished account of the genus *Salsola* and the genera of *Halanthium* and *Halimocnemis* (written by I. C. Hedge) and thank him for his valuable discussions. I further appreciate the great helps of my friends in Mashhad University Herbarium (Dr. M. H. Rashed, Mr. M. R. Joharchi, Mr. Zangui and Mrs. H. Safavi) and those of Natural History Museum of Iran and Research Institute of Forests and Rangelands for their generous cooperations during field studies and herbarium visits. The improving of the English text by Dr. W. Kofer (Munich) is also much grateful.

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– 1992 (1993): New species and new plant records from Iran. – Iran. J. Bot. 5(2): 57–63.

FREITAG, H. (in press): The genus *Salsola* L. (Chenopodiaceae) – In: RECHINGER, K.H. (ed.): Flora Iranica. – Graz.

HEDGE, I.C. (in press): The genera *Halanthium* C. Koch and *Halimocnemis* C.A. Mey. (Chenopodiaceae) – In: RECHINGER, K.H. (ed.): Flora Iranica. – Graz.

LÉONARD, J. 1989: Contribution a l'étude de la flore et de la végétation des deserts d'Iran, 9. Jardin botanique national de Belgique. – Louvain.

MOQUIN-TANDON, C.H.B.A. 1840: Chenopodearum monographia Enumeratio. – Paris.

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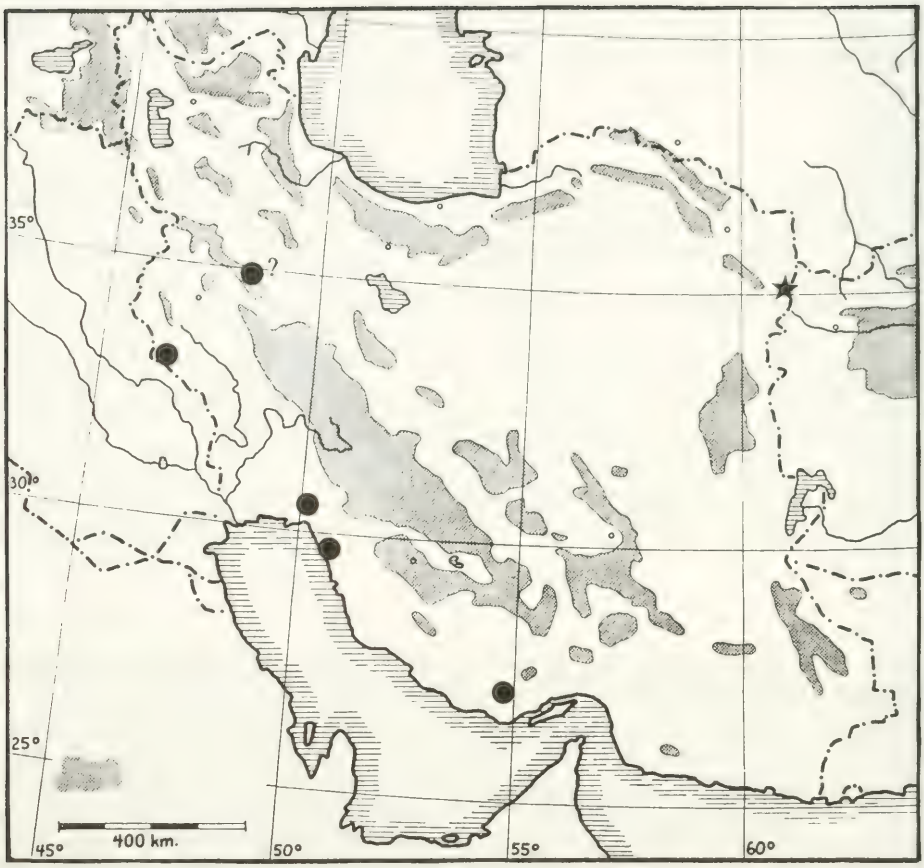

Map 1. Distribution of ● *Halimocnemis purpurea* Moq.
★ *Salsola zehzadi* Akhani

Los géneros Danthonia DC. y Rytidosperma Steud. (Poaceae) en América – Una revisión*

C. M. BAEZA P.

Resumen:
BAEZA P., C.M.: Los géneros Danthonia DC. y Rytidosperma Steud. (Poaceae) en América – Una revisión. – Sendtnera 3: 11–93. 1996. – ISSN 0944–0178.

Se hace una revisión taxonómica de las especies americanas de los géneros *Danthonia* DC. y *Rytidosperma* Steud. Se entregan antecedentes que permiten separar ambos géneros sobre la base de caracteres morfológicos y utilizando análisis fenético.
El carácter fundamental que permite separar ambos géneros es la morfología de la lema. Todas las especies de *Rytidosperma* presentan pelos en el dorso de la lema agrupados en fascículos dispuestos en hileras transversales, situación que nunca ocurre en las especies del género *Danthonia*. La pálea presenta en todas las especies de *Rytidosperma* algún tipo de pilosidad, ya sea en el dorso o en los bordes inferiores. Esto ocurre en muy pocas especies de *Danthonia*, en donde el carácter glabro es el que predomina. Las lodículas siempre son pilosas en *Rytidosperma*, en cambio en *Danthonia* la pilosidad en ellas es poco frecuente. Ninguna especie de *Rytidosperma* presenta espiguillas cleistógamas axilares y en las vainas basales, lo que si ocurre muy a menudo en *Danthonia*.
Para *Danthonia* se reconocen 28 entidades taxonómicas y para *Rytidosperma* ocho entidades. Se describe una nueva subespecie para la ciencia, *Danthonia secundiflora* J.Presl subsp. *mattheii* C.M.Baeza, perteneciente al complejo *D. secundiflora* J.Presl, y se realiza una nueva combinación, *Danthonia chilensis* E.Desv. var. *aureofulva* (E.Desv.) C.M.Baeza, dentro del complejo *D. chilensis* E.Desv.

Zusammenfassung:
Die amerikanischen Arten der Gattungen *Danthonia* DC. und *Rytidosperma* Steud. werden revidiert.
Anhand morphologischer Kriterien und phänetischer Analysen werden die beiden Gattungen voneinander abgegrenzt. Das wichtigste Unterscheidungsmerkmal ist die morphologische Gestaltung der Deckspelze. Im Gegensatz zu *Danthonia* besitzen alle Arten von *Rytidosperma* am Rücken der Deckspelze Haarbüschel, die in transversalen Reihen angeordnet sind.
Die Vorspelze ist bei *Rytidosperma* immer behaart, wobei die Haare entweder am Rücken oder am unteren Rand der Vorspelze sitzen. Eine solche Behaarung

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* Este trabajo es una parte de la Tesis Doctoral presentada a la Escuela de Graduados de la Universidad de Concepción, Chile, en marzo de 1995.

kann bei *Danthonia* nur selten beobachtet werden, hier ist die Vorspelze überwiegend kahl. Auch die Lodiculae sind bei *Rytidosperma* behaart, während sie bei den Arten von *Danthonia* nur selten eine Behaarung aufweisen.
Cleistogamie ist bei *Rytidosperma* nicht vorhanden, wohingegen bei *Danthonia* sowohl axilläre als auch in den basalen Blattscheiden stehende cleistogame Ährchen häufig zu beobachten sind.
Die Gattung *Danthonia* DC. wird in 28 Taxa, die Gattung *Rytidosperma* in 8 Taxa untergliedert.
Innerhalb des Komplexes *D. secundiflora* J.Presl wird eine neue Unterart beschrieben, *D. secundiflora* J.Presl subsp. *mattheii* C.M.Baeza. Des weiteren wird in der *D. chilensis* E.Desv.-Gruppe eine Neukombination vorgenommen, *D. chilensis* E.Desv. var. *aureofulva* (E.Desv.) C.M.Baeza.

Introducción

La familia Poaceae (Gramineae) agrupa alrededor de 600 géneros con aproximadamente 7500 especies, distribuidas en 25 tribus (GOULD & SHAW 1983), y está ubicada dentro de las más evolucionadas de las monocotiledóneas (CLAYTON 1975), ocupando casi todos los ambientes terrestres. Es una de las familias más grandes de las Angiospermas, y una de las más importantes desde el punto de vista económico. Incluye una gran variedad de plantas que proporcionan alimentos al hombre y otros animales, como es el caso del trigo, arroz, maíz, centeno, cebada, avena, sorgo, mijo. Muchas especies de los géneros *Calamagrostis*, *Festuca*, *Poa* y *Stipa* constituyen los principales componentes del paisaje vegetal en estepas y sabanas. También son utilizadas como ornamentales, y algunas de ellas como materiales de construcción (TSVELEV 1983).

Los géneros del presente estudio, *Danthonia* DC. y *Rytidosperma* Steud., están representados por plantas pequeñas, cespitosas o rizomatosas, perennes, que abarcan alrededor de 80 especies, la mayoría de ellas distribuidas en el Hemisferio Sur. En lugares como Australia, Nueva Zelandia y Sudáfrica, son valiosas como especies forrajeras (VICKERY 1956; GOULD & SHAW l.c.; WATSON & DALLWITZ 1992). Ambos géneros están incluidos en la subfamilia Arundinoideae (RENVOIZE 1981; CLAYTON & RENVOIZE 1986, RENVOIZE 1986), y en la tribu Danthonieae (CONNOR & EDGAR 1986; NICORA & RÚGOLO 1987).

DOBRENZ & BEETLE (1966) plantean que las especies de *Danthonia* de Norte y Sudamérica parecen estar más relacionadas entre sí que con las especies del Viejo Mundo. Esto podría deberse a que probablemente la colonización de sur a norte fue relativamente rápida. También parece ser que las especies de Norteamérica derivaron de las sudamericanas, debido a las siguientes consideraciones: ausencia de especies árticas y subárticas, prácticamente ausencia del género en Europa y Asia, mayor número de especies en Sudamérica, presencia del género en los trópicos de Brasil, Islas del Caribe y México Central, número básico de cromosomas 2n = 36 para la mayoría de las especies de ambas regiones, presencia de cleistogamia en ambas regiones y una epidermis abaxial con pelos bicelulares y células silíceas halteriformes en las dos áreas.

Historia de los estudios previos de ambos géneros en el continente americano

1753: LINNEO, Species Plantarum 75, 80, describe las especies *Festuca decumbens* y *Avena spicata*.

1805: DE CANDOLLE, Flore Française, ed. 3,3: 33, crea el género *Danthonia*, y hace la combinación *D. decumbens*, sobre la base del material anteriormente descrito por Linneo.
1817: ROEMER & SCHULTES, Systema Vegetabilium. 2: 690, hacen la combinación *D. spicata*, basados en *Avena spicata* L.
1818: NUTTAL, Gen. N. Amer. Pl. 1: 71, describe *D. sericea* para los Estados Unidos.
1830: PRESL, J., Reliquiae Haenkeanae 1: 255, describe *D. secundiflora*, en base a material colectado, al parecer, en Perú.
1843: NEES & MEYEN, Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19, Suppl. 1: 157, describen para Chile *D. picta*, colectada por Meyen en la Cordillera de San Fernando.
1854: DESVAUX, in GAY, Fl. Chil. 6: 233–469, realiza una revisión completa del género *Danthonia* en Chile, describiendo cuatro especies nuevas, *D. aureofulva*, *D. chilensis*, *D. violacea* y *D. virescens*, e incluyendo también la especie descrita por NEES & MEYEN (l.c.).
1854: STEUDEL, Synopsis Plantarum Glumacearum. 1: 474, describe 3 nuevas especies para Chile, *Avena ariguensis*, *Trisetum malacanthum* y *Rytidosperma lechleri*.
1858: PHILIPPI, Linnaea 29: 96, describe *D. collina*.
1863: BOLANDER, Proc. Calif. Acad. Sci. 2: 182 describe para Estados Unidos la especie *D. californica*.
1869: AUSTIN, C., State Cab. Nat. Hist. 22(87): 54, describe *D. compressa* para Estados Unidos.
1873: PHILIPPI, Anales Univ. Chile 43: 568, describe para Chile *D. grandiflora*, colectada en la provincia de Ñuble.
1878: DOELL, in VON MARTIUS, C.F.P., Fl. Bras. 2(3): 101–102, describe *D. montana* y *D. tenuifolia* para Brasil.
1883: VASEY, Bull. Torrey Bot. Club 10: 52, describe *D. intermedia*, en base a material colectado en California, Estados Unidos.
1888: MACOUN, Cat. Can. Pl. 2(4): 215, describe *D. unispicata* para Estados Unidos.
1896: HACKEL & ARECHAVALETA, Anales Mus. Nac. Montevideo IV: 367–370, describen dos especies para Uruguay, *D. cirrata* y *D. montevidensis*.
1896: SCRIBNER, Bot. Gaz. 21: 133, describe *D. parryi* para Estados Unidos.
1896: PHILIPPI, Anales Univ. Chile 94: 5–34, describe cuatro nuevas especies para Chile, *D. araucana*, *D. calva*, *D. glabra* y *D. andina*.
1902: HACKEL, Oesterr. Bot. Z. 52(5): 187–194, describe dos especies para Brasil, *D. breviseta* y *D. macrophylla*, en base a material colectado por M. Glaziou.
1902: HACKEL & ARECHAVALETA, Anales Mus. Nac. Buenos Aires 7: 111, describen para Argentina *D. cirrata* var. *melanathera*.
1909: HACKEL & PILGER, in URBAN, U., Symbolae Antillanae 6: 1, describen *D. domingensis* para República Dominicana.
1909: BRITTON, Torreya 9(9): 210, describe *D. shrevei* para Jamaica.
1917: HUBBARD, C.E., Contr. Gray Herb. 52: 60, describe *D. filifolia* para México.
1922: PILGER, in SKOTTSBERG, Nat. Hist. Juan Fernandez 2: 67, describe *D. paschalis* para la Isla de Pascua.
1928: HITCHCOCK, Proc. Biol. Soc. Wash. 41: 160, describe *D. californica* var. *americana* para Estados Unidos.
1929: PILGER, in WERDERMANN, Notizbl. Bot. Gart. Berlin-Dahlem 10: 759, hace la combinación *D. malacantha*, basado en *Trisetum malacanthum* Steud.
1936: CHASE, A., U.S.D.A. Misc. Circ. 243: 70, describe *D. obtorta* para Haití.
1961: SWALLEN, Comun. Bot. Mus. Hist. Nat. Montevideo 39(3): 1–3, describe *D. rhizomata* y *D. charruana* para el Estado brasileño de Rio Grande do Sul.

1970: ROSENGURTT et al., Gramín. uruguayas: 55, realizan dos combinaciones para Uruguay, *D. secundiflora* subsp. *charruana* y *D. secundiflora* subsp. *secundiflora*.
1973: NICORA, Darwiniana 18: 80–106, describe *D. chilensis* var. *glabriflora* para Argentina, y revalida el género *Rytidosperma*, haciendo las siguientes combinaciones: *R. glabrum*, *R. pictum* var. *pictum*, *R. violaceum*, *R. virescens* var. *virescens*, además de describir las variedades *R. virescens* var. *parvispiculum*, *R. virescens* var. *patagonicum*, *R. pictum* var. *bimucronatum* y la especie *R. sorianoi*.
1975: CONERT, Senckenberg. Biol. 56(4/6): 293–313, realiza un detallado estudio de la especie *D. domingensis*, concluyendo que tanto *D. obtorta* como *D. shrevei* no son más que subespecies de *D. domingensis*. Además, describe *D. chaseana* como una nueva especie para Brasil.
1977: BERNARDELLO, Kurtziana 10: 249, eleva a rango específico *D. cirrata* Hackel & Arechav. var. *melanathera* Hackel.
1990: BAEZA, C.M., Gayana, Bot. 47(3–4): 84, traslada *D. paschalis* al género *Rytidosperma*.
1992: DAVIDSE, Novon 2(2): 100, describe *D. chiapasensis* para México.
1993: PETERSON & RÚGOLO, Madroño 40(2): 71, describen *D. annableae* para Potosí, Bolivia.

Entre 1927 y 1994 diversos autores realizan estudios, en los cuales citan especies de *Danthonia* y *Rytidosperma* para el continente americano, pero basados en las especies ya previamente descritas.

HITCHCOCK (1927) cita a *D. secundiflora* para Venezuela, Ecuador y Perú. STANDLEY (1936), BRAKO & ZARUCCHI (1993) y TOVAR (1993) la vuelven a citar para este último país.

HITCHCOCK (1951) señala siete especies de *Danthonia* para Estados Unidos: *D. californica* var. *americana*, *D. californica* var. *californica*, *D. compressa*, *D. intermedia*, *D. parryi*, *D. sericea*, *D. spicata* y *D. unispicata*.

CONERT (1960) estudió la morfología y la estructura de la hoja de *D. mexicana*, especie descrita para México por SCRIBNER en 1891, concluyendo que se trataba de un nuevo género, *Metcalfia*, con una sola especie, *M. mexicana*. Incluyó este género en las Aveneae. Posteriormente, TATEOKA (1964) estudió el embrión de esta especie y corroboró lo señalado por CONERT, al incluirla en la misma tribu y señalando además, que se trataría de uno de los géneros festucoides más primitivos.

BAUM & FINDLAY (1973) y FINDLAY & BAUM (1974) reconocen para Canadá las siguientes especies de *Danthonia*: *D. californica*, *D. canadensis*, *D. compressa*, *D. parryi*, *D. sericea*, *D. spicata* y *D. unispicata*.

POHL (1980) y POHL & DAVIDSE (1994) señalan la especie *D. decumbens* para Costa Rica.

MARTICORENA & QUEZADA (1985) señalan once especies de *Danthonia* y cuatro de *Rytidosperma* para Chile: *D. andina*, *D. araucana*, *D. aureofulva*, *D. californica* var. *americana*, *D. calva*, *D. chilensis* var. *chilensis*, *D. chilensis* var. *glabriflora*, *D. collina*, *D. malacantha*, *D. octoflora*, *D. oresigena*, *D. paschalis*, *R. glabrum*, *R. pictum* var. *pictum*, *R. violaceum* y *R. virescens* var. *virescens*.

SANTOS & CASTRO (1989) reconocen las siguientes especies de *Danthonia* para el Estado de Rio Grande do Sul, Brasil: *D. cirrata*, *D. montana*, *D. montevidensis*, *D. rhizomata*, *D. secundiflora* subsp. *charruana* y *D. secundiflora* subsp. *secundiflora*.

Finalmente, DERTSCHENY (1989) reconoce para Sudamérica solamente especies de *Danthonia*: *D. andina*, *D. araucana*, *D. breviseta*, *D. californica*, *D. charruana*, *D. chaseana*, *D. chilensis*, *D. cirrata*, *D. glabra*, *D. malacantha*, *D. montevidensis*, *D. rhizomata*, *D. picta*, *D. secundiflora*, *D. violacea* y *D. virescens*.

En resumen, no existe ningún trabajo actualizado que incluya la revisión total de ambos géneros en el continente americano, y que discuta la separación entre ellos.

Enfoques y procedimientos usados en esta investigación

Por tratarse de un trabajo eminentemente taxonómico-florístico, se usaron caracteres morfológicos. CAMPBELL et al. (1983) realizaron un estudio detallado de la cleistogamia en la familia, discutiendo su distribución y significado biológico. Para la mayoría de las disciplinas biológicas, es de suma necesidad identificar a los organismos con los cuales se trabaja. El propósito primario de la taxonomía es satisfacer esta necesidad (CLAYTON 1981).

Morfología floral: es el carácter más importante para la discriminación de los géneros y especies dentro de la familia Poaceae. Tradicionalmente, se reconoce que el estudio de la espiguilla y antecios resulta ser decisiva cuando se pretende realizar un examen acabado de un grupo determinado.

Cleistogamia: La cleistogamia se define como la producción autógama de flores cerradas, y está ampliamente distribuida en las Angiospermas (LORD 1981), y especialmente en las Gramíneas (CONNOR 1986). Un carácter general para todos los tipos de flores cleistógamas es la reducción de las piezas florales de la corola y androceo. DOBRENZ & BEETLE (1966) señalan que para *Danthonia* lo más característico en las espiguillas cleistógamas axilares y en la Vainas basales, es la pérdida o ausencia de las glumas; además, observan que en *D. californica*, *spicata* y *unispicata* no hay diferencias aparentes entre las plantas obtenidas vía flores cleistógamas y casmógamas. En *D. intermedia* no detectaron ningún tipo de cleistogamia.

Numerosos son los autores que han estudiado la presencia de espiguillas cleistógamas en especies norteamericanas de *Danthonia* (CHASE 1918; WEATHERWAX 1928; GATES 1937; CLAY 1983; CLAY & ANTONOVICS 1985 a, 1985 b). Lo mismo sucede con las especies sudamericanas (ROSENGURTT & ARRILLAGA 1961, 1963; ROSENGURTT et al. 1970; NICORA 1973, 1978).

Los factores ambientales influencian la producción de flores cleistógamas y casmógamas, pero cuando los organismos crecen bajo condiciones naturales, ambos procesos ocurren al mismo tiempo en el ciclo de vida de la mayoría de las plantas (WALLER 1980). Esto estaría indicando que la producción de este tipo de flores forma parte integral de la planta, y no sólo producto en condiciones ambientales extremas o deficientes. CLAY (1982) encontró que tanto factores ambientales como genéticos afectan la expresión de espiguillas cleistógamas en *D. spicata*, y que los factores genéticos serían más importantes.

El objetivo general de esta investigación es clarificar la sistemática del género *Danthonia* y *Rytidosperma* en América, mediante una revisión taxonómica integral, y que incluya además, información adicional sobre la distribución y hábitat.

Para llevar a cabo el objetivo general se plantearon los siguientes objetivos específicos:

1. Caracterizar desde el punto de vista morfológico las especies americanas de *Danthonia* DC. y *Rytidosperma* Steud.

2. Investigar la historia nomenclatural y sinonimia de cada una de las especies de *Danthonia* DC. y *Rytidosperma* Steud. en el continente americano.

Materiales y métodos

Se estudió un número aproximado de 2000 ejemplares, de los siguientes herbarios: B, BA, BAA, BM, BR, C, COL, CONC, CORD, DS, FR, G, GOET, HIP, IPN, K, LP, M, MO, MY, NY, S, SGO, SI, SP, VALD, W, y del herbario particular de OTTO ZÖLLNER, Quilpué, Chile. Las abreviaturas corresponden a las utilizadas por HOLMGREN, HOLMGREN & BARNETT (1990).

Todas las medidas referidas al antecio se hicieron considerando el último de la espiguilla terminal, debido a que hay una gran variación dentro de la espiguilla, en cuanto al tamaño de éste. De esta forma, las medidas dadas en las descripciones no son aplicables a los antecios superiores.

Se hizo un estudio fenético y de análisis de componentes principales (PCA), utilizando datos multiestados cuantitativos continuos (mm) y de doble estado, provenientes del estudio morfológico. Todos los datos fueron tratados estadísticamente, y las medidas señaladas en las matrices originales de datos corresponden al promedio más el error estándar de la media para cada carácter. Se utilizó el programa de taxonomía numérica Rohlf's NTSYS-PC. Las variables fueron estandarizadas antes de la aplicación de los índices correspondientes. La estandarización consistió en la sustracción de la media dividida por la desviación estándar. El índice usado fue de correlación (CORR, product-moment correlation). El dendrograma se generó vía ligamiento promedio no ponderado (UPGMA).

Evaluación de los caracteres diagnósticos

La selección de los caracteres diagnósticos resulta de vital importancia para la discriminación entre las especies en estudio, aunque, a veces existe un alto grado de variabilidad, lo que muchas veces dificulta la separación entre los taxa.

Morfología

Hábito: todas las especies de ambos géneros son cespitosas, pero varian considerablemente en la altura. Este carácter está influenciado por las condiciones ambientales, por lo tanto su valor diagnóstico es limitado. Presentan pequeño tamaño (menores de 20 cm en promedio) *D. annableae*, *D. unispicata*, *R. lechleri*, *R. pictum* var. *bimucronatum*, *R. sorianoi* y *R. virescens* var. *parvispiculum*. Presentan gran tamaño (mayores de 40 cm en promedio) *D. breviseta*, *D. californica*, *D. compressa*, *D. domingensis* subsp. *domingensis*, *D. domingensis* subsp. *shrevei*, *D. parryi* y *D. sericea*. La presencia de un rizoma bien desarrollado es raro, y sólo se observa en *D. domingensis* subsp. *shrevei* y *D. rhizomata*. Las Innovaciones son intra o extravaginales.
Hojas basales: es un carácter muy variable. La longitud, anchura, y pilosidad varían considerablemente dentro de ambos géneros y especies.
Vainas foliares: pueden ser glabras o pilosas. Presentan siempre Vainas glabras *D. annableae*, *D. californica* var. *americana*, *D. chaseana*, *D. chiapasensis*, *D. chilensis* var. *chilensis*, *D. chilensis* var. *glabriflora*, *D. compressa*, *D. domingensis* subsp. *domingensis*, *D. domingensis* subsp. *obtorta*, *D. parryi*, *D. secundiflora* subsp. *charruana*, *D. secundiflora* subsp. *secundiflora*, *R. pictum* var. *bimucronatum* y *R. virescens* var. *virescens*. Presentan siempre Vainas pilosas *D. chilensis* var. *aureofulva*, *D. melanathera*, *D. rhizomata*, *R. paschale*, *R. sorianoi* y *R. virescens* var. *parvispiculum*. En todas las especies hay presencia de mechones de pelos a ambos costados

de la Lígula, aunque, a veces faltan en *R. lechleri*. La longitud de estos pelos es variable.
Lígula: para ambos géneros este carácter está representado por una hilera de pelos, bastante variables en longitud.
Láminas foliares: la longitud y pilosidad son carácteres bastante variables. La mayoría de las especies presentan láminas angostas, no mayores de 3 mm. Sin embargo, suelen ser bastante anchas en *D. breviseta*, *D. chiapasensis* y *D. domingensis* subsp. *shrevei*.
Panícula: el tamaño de la panícula y su densidad, es decir, pocas o muchas espiguillas, y el grado de expansión, resultan ser carácteres útiles cuando se comparan especímenes bien desarrollados o en similares estados de madurez. *D. annableae* y *D. unispicata* presentan una panícula reducida a 1–2 espiguillas, en cambio *D. breviseta* puede tener sobre 100. Presentan panícula cerrada *D. spicata* y *D. intermedia*, y abierta *D. californica* y *D. compressa*. La forma de la panícula varía considerablemente de acuerdo al grado de madurez, de forma tal que es un carácter de bajo valor. Los pedicelos de las espiguillas y ramas de la inflorescencia son pilosos o pubescentes, a excepción de *D. breviseta* y *D. chaseana*.
Espiguillas: es un carácter variable, sobre todo el tamaño. Presentan espiguillas pequeñas (menores de 10 mm en promedio) *D. chaseana*, *D. decumbens*, *R. lechleri* y *R. sorianoi*. Espiguillas de gran tamaño (mayores de 23 mm en promedio) están presentes en *D. californica*, *D. chiapasensis*, *D. domingensis* subsp. *obtorta*, *D. malacantha*, *D. melanathera*, *D. parryi* y *D. rhizomata*. El número de antecios por espiguilla también es un carácter bastante variable. La gran mayoría de las especies presentan 4–6 antecios, a excepción de *D. chaseana* y *D. decumbens*, donde el número es menor. En las especies del género *Rytidosperma* hay una tendencia a una reducción en el número de espiguillas, comparadas con *Danthonia*. En la casi totalidad de las especies en estudio se encontró que el último o los dos últimos antecios son estériles.
Glumas: el largo de las glumas está frecuentemente relacionado con el tamaño de la espiguilla. Pueden ser iguales o subiguales dependiendo de las especies. Presentan glumas pequeñas (menores de 11 mm en promedio) *D. araucana*, *D. breviseta*, *D. chaseana*, *D. compressa*, *D. decumbens*, *D. domingensis* subsp. *domingensis*, *D. domingensis* subsp. *shrevei* y *D. spicata*. Todas las especies de *Rytidosperma* presentan glumas pequeñas, no mayores de 13,5 mm de longitud en promedio. Glumas de gran tamaño (mayores de 18 mm en promedio) están presentes en *D. melanathera* y *D. parryi*. La forma de las glumas es un carácter algo variable, aunque la mayoría son lanceoladas. De todas las especies en estudio, sólo *D. domingensis* subsp. *domingensis* y la subsp. *shrevei* presentan glumas siempre menores que el conjunto de los antecios. La venación y el color también son carácteres variables.
Lema: es el carácter más importante para diferenciar los géneros y las especies, aunque existe una gran variación, sobre todo a nivel biométrico.
La lema consiste de un callo basal, una porción superior denominada cuerpo de la lema, dos lóbulos laterales y una arista de posición dorsal.
El callo es bastante variable en longitud, y siempre presenta algún tipo de pilosidad. Frecuentemente, los antecios inferiores de la espiguilla presentan un callo de menor tamaño que los antecios superiores. Sin embargo, hay una tendencia a que las especies de *Danthonia* presenten un callo de mayor longitud que las especies de *Rytidosperma*.
El cuerpo de la lema es el carácter que entrega la mayor información. Aunque el tamaño resulta ser variable, la presencia o ausencia de pelos, y su distribución, son fundamentales para discriminar los géneros y las especies. *Danthonia* puede presentar el cuerpo de la lema glabro, piloso sólo en los márgenes, o piloso en los márgenes y el dorso. Cuando hay pelos, éstos están distribuídos irregularmente en la superficie, en cambio en *Rytidosperma*, ellos se agrupan en haces de fascículos dispuestos en hileras

transversales, no obstante a veces hay pelos ralos no agrupados en fascículos entre la hilera superior e inferior.
Los lóbulos laterales son tan variables en tamaño como el cuerpo de la lema. Normalmente están bien desarrollados. Pueden ser mayores de 8 mm en promedio (*D. chiapasensis*, *D. cirrata*, *D. domingensis* subsp. *obtorta*, *D. melanathera*, *D. montevidensis*, *D. rhizomata* y *R. virescens* var. *virescens*), menores de 3,5 mm en promedio (*D. annableae*, *D. breviseta*, *D. chaseana*, *D. compressa*, *D. intermedia*, *D. spicata*, *R. lechleri* y *R. sorianoi*), o estar reducidos a un mucrón, como es el caso de *D. decumbens*. En la gran mayoría de las especies los lóbulos son aristados. La longitud de las aristas también es un carácter muy variable.
La arista dorsal está presente en la totalidad de las especies, a excepción de *D. decumbens*, donde sólo hay un pequeño mucrón. La longitud es variable entre y dentro de las especies.
Pálea: puede ser elíptica, lanceolada, obovada, ovada, linear-lanceolada u oblanceolada. El largo y el ancho son carácteres variables. En todas las especies es aquillada, y los márgenes son fínamente ciliados. El ápice de la pálea resulta ser muchas veces importante para separar especies y variedades. Frecuentemente, este carácter es más o menos estable dentro de cada una de las especies, aunque hay excepciones, como es el caso de *D. intermedia* y *R. violaceum*. En cuanto a la pilosidad de la pálea, está presente en todas las especies de *Rytidosperma*, tanto en el dorso como en los bordes inferiores, al menos en algún estado de su desarrollo, a veces se encuentran especies con pálea glabra en la madurez. En *Danthonia* ocurre todo lo contrario, puesto que es muy poco frecuente que la pálea presente algún tipo de pilosidad.
Lodículas: en la gran mayoría de las especies son de pequeño tamaño. Todas las especies de *Rytidosperma* presentan lodículas pilosas, en cambio, en *Danthonia* es un carácter muy poco frecuente, puesto que casi todas son glabras.
Ovario: es súpero, unilocular y con dos estilos libres. Es un carácter que no tiene valor diagnóstico, puesto que es altamente conservativo en ambos géneros.
Estambres: hay tres estambres presentes en todas las especies. El tamaño de las anteras parece estar relacionado al tamaño de la lema, es decir, mientras mayores sean las anteras mayor es la lema.
Cariopsis: puede ser elíptica, ovoide, obovada, u obovado-elíptica. Es de color café claro en un gran número de especies. El dorso tiende a ser algo convexo. El embrión superficialmente no tiene valor taxonómico. El hilo frecuentemente es alargado a sublinear en *Danthonia* y oval a elíptico en *Rytidosperma*.
Cleistogamia: la presencia de espiguillas cleistógamas es un carácter casi generalizado en *Danthonia*, y no fue observado en *D. breviseta*, *D. chaseana*, *D. chiapasensis*, *D. domingensis* y *D. parryi*. En el género *Rytidosperma* no se observó ningún tipo de cleistogamia, salvo en *R. paschale*, donde se encontraron espiguillas cleistógamas aéreas, con anteras muy reducidas.

Validez del género Danthonia y Rytidosperma

La separación entre ambos géneros fue ya insinuada por DESVAUX (1854), cuando considera para *Danthonia* dos secciones:

"I. Callus (base coriácea de la paleta inferior) alargado, decurrente, envolviendo enteramente cada artículo del raquis y pareciendo constituirlo. Pelos situados en el borde de la paleta", con las especies *D. chilensis* y *D. aureofulva*.
"II. Callus (base coriácea de la paleta inferior) muy corto, artículos del raquis de la flor visibles. Pelos dispuestos por series transversales", con las especies *D. virescens*, *D. picta* y *D. violacea*.

ZOTOV (1963) crea el género *Notodanthonia*, cuando hace una revisión de la subfamilia Arundinoideae en Nueva Zelandia. Sinonimiza todas las especies dadas para *Danthonia* a este nuevo género. En la descripción del género señala: "long lemma hairs mostly in tufts in one or two more or less complete transverse series; callus more or less flattened; flowers hermaphrodite (cleistogens not known); lodicules 2, more or less truncate, long ciliate; hilum basal, round to somewhat elliptic". NICORA (1973) separa las especies argentinas y chilenas de *Danthonia* en dos, aceptando el género *Rytidosperma*, creado por STEUDEL (1854), y sinonimiza *Notodanthonia* con *Rytidosperma*, aplicando el artículo 62 del Código Internacional de Nomenclatura, que no autoriza un cambio de nombre aunque haya que enmendar la descripción del género más antiguo. CONNOR & EDGAR (1979) transfieren a *Rytidosperma* todas las especies previamente incluídas en *Notodanthonia* para Nueva Zelandia. VELDKAMP (1980) revalida este último género, haciendo nuevas combinaciones para las especies de Australia, Sudamérica y Malasia. Actualmente, la tendencia casi generalizada es reconocer a *Rytidosperma* como un género distinto de *Danthonia* (COPE 1984; TOMLINSON 1985; CLAYTON & RENVOIZE 1986; CONNOR & EDGAR 1979, 1986; BAEZA 1990; WATSON & DALLWITZ 1992). Sin embargo, existen todavía algunos autores que no reconocen *Rytidosperma* como tal, y lo incluyen dentro de *Danthonia*, argumentándose, básicamente, en que este último presenta una gran variabilidad, debido a la enorme distribución que posee, y que caracteres como la presencia de espiguillas cleistógamas y lodículas ciliadas o glabras no son suficientes para separar y aceptar el género (CONERT 1986; DERTSCHENY 1989).

Es efectivo que algunas especies de *Danthonia* pueden presentan lodículas ciliadas, como es el caso de *D. annableae*, *D. araucana*, *D. breviseta*, *D. californica*, *D. chiapasensis*, *D. cirrata*, *D. domingensis* subsp. *obtorta*, *D. domingensis* subsp. *shrevei*, *D. malacantha*, *D. melanathera*, *D. parryi*, *D. secundiflora* subsp. *secundiflora* y *D. unispicata*. Sin embargo, este carácter debe considerarse raro, puesto que la frecuencia es muy baja dentro de cada especie, siendo el carácter glabro el que predomina en el género. Todas las especies de *Rytidosperma* estudiadas presentan siempre lodículas pilosas. La presencia de espiguillas cleistógamas es casi generalizada en *Danthonia*, no así en *Rytidosperma*, donde sólo se detectaron espiguillas cleistógamas aéreas en *R. paschale*. CONERT (1986) también señala lo mismo para *R. violaceum*, condición no observada luego de revisar más de 70 carpetas. Ninguna especie de este género presenta espiguillas cleistógamas axilares y en las vainas basales. Un carácter que ha pasado casi inadvertido por muchos autores es la pilosidad de la pálea. Para ambos géneros los márgenes de ésta son finamente ciliados. Sin embargo, todas las especies de *Rytidosperma* presentan cilios en el dorso y márgenes inferiores, al menos en algún periodo de desarrollo de la pálea, lo que sólo fue detectado en muy pocas ocasiones en *D. breviseta*, *D. chaseana*, *D. domingensis* subsp. *domingensis*, *D. domingensis* subsp. *shrevei*, y *D. malacantha*, pero únicamente en el dorso, nunca en los márgenes inferiores, a excepción de *D. chiapasensis*. Por último, la presencia de fascículos de pelos dispuestos en bandas transversales está siempre presente en *Rytidosperma*, lo que no ocurre en *Danthonia*.

Análisis fenético en Danthonia y Rytidosperma

El análisis fenético también corrobora la separación de los dos géneros. Para este análisis se consideraron los siguientes caracteres morfológicos (mm):

- Tamaño de la planta
- Largo de la gluma superior

- Largo de la gluma inferior
- Tamaño de la espiguilla terminal
- Largo de la lema más el callo
- Largo de la lema más las aristas
- Largo de la pálea
- Ancho de la pálea
- Tamaño del callo
- Largo de la arista dorsal
- Largo de los lóbulos de la lema
- Largo de las aristas de los lóbulos de la lema
- Largo desde la base hasta la arista dorsal
- Tamaño de las lodículas
- Largo de la cariopsis
- Ancho de la cariopsis
- Largo del pedicelo de la espiguilla
- Tamaño de la panícula
- Pelos de la lema agrupados en fascículos (presencia, ausencia)
- Pelos en el dorso y márgenes inferiores de la pálea (presencia, ausencia)

En el dendrograma (Fig. 1) se puede observar la presencia de dos grandes grupos. Un grupo superior formado por todas las especies del género *Danthonia* estudiadas y un grupo inferior formado por todas las especies de *Rytidosperma*.

En el gráfico de ordenación (Fig. 2) se observa la misma tendencia, puesto que las especies del 29 al 36 (todas especies de *Rytidosperma*) se ordenan prácticamente en el mismo cuadrante.

Los caracteres que más contribuyen a la ordenación en el primer eje son: el largo de la gluma superior, el largo de la gluma inferior, el tamaño de la espiguilla terminal, el largo de la lema más el callo, el largo de la lema más las aristas, el largo de la pálea, el tamaño del callo, el largo de la arista dorsal, el largo de los lóbulos de la lema, el largo desde la base hasta la arista dorsal y el tamaño de las lodículas. Es decir, todos caracteres relacionados con la espiguilla.

Los caracteres que más contribuyen a la ordenación en el segundo eje son: el ancho de la pálea, el largo de la arista de los lóbulos de la lema, el largo de la cariopsis y el largo del pedicelo de la espiguilla.

En el tercer componente, los caracteres que más contribuyen son: el tamaño de la planta, el ancho de la cariopsis, el tamaño de la panícula, la presencia de pelos de la lema agrupados o no en fascículos y la presencia o ausencia de pelos en el dorso y márgenes inferiores de la pálea.

Parte Taxonómica

Clave para separar los géneros

1 Lema glabra o pilosa, los pelos se distribuyen en el dorso y márgenes, o sólo en los márgenes, nunca formando fascículos dispuestos en hileras paralelas. Lodículas glabras, raro pilosas. Artejos de la raquilla poco visibles. ***Danthonia***

– Lema pilosa, los pelos se agrupan en fascículos dispuestos en 2 hileras paralelas. Lodículas siempre pilosas. Artejos de la raquilla visibles. ***Rytidosperma***

Danthonia DC., in J.P. Lamarck & A.P. De Candolle, Fl. Franç., ed. 3,3: 32. 1805.

Plantas herbáceas, perennes, rizomatosas o cespitosas, con hojas planas o convolutas, con pelos al costado de la Lígula. Lígula conformada por pelos, generalmente largos. Inflorescencia una panícula con varias espiguillas o reducida a una sola en *Danthonia unispicata* o 1–2 en *Danthonia annableae*. Espiguillas plurifloras, casmógamas o cleistógamas, comprimidas lateralmente. Raquilla articulada arriba de las glumas y entre los antecios, artejos de la raquilla muy cortos. Glumas 2, mayores, iguales o menores que el conjunto de los antecios, persistentes sobre los pedicelos, plurinervadas, a veces con nervios transversales, lanceoladas, linear-lanceoladas, lineares, ovado-lanceoladas. Lema membranácea o papirácea, glabra en el dorso y márgenes o pilosa, cuando presenta pilosidad, ésta está distribuída irregularmente, nunca formando hileras transversales de fascículos, plurinervadas, con una arista de posición dorsal generalmente geniculada y con la columna basal retorcida, ápice bidentado o bilobulado, dientes y lóbulos más o menos largos, prolongados generalmente en aristas rectas. Pálea elíptica, lanceolada, obovada, ovada, linear-lanceolada, oblanceolada, hialina, membranácea o coriácea, bicarenada, finamente ciliada en los márgenes, con el ápice emarginado, truncado, obtuso, agudo, bidenticulado. Callo alargado, raro corto, piloso. Lodículas 2, o ausentes en las flores cleistógamas, cuneadas o flabeliformes, glabras, raro pilosas. Estambres 3, anteras grandes o pequeñas. Ovario glabro. Estigmas 2, plumosos. Cariopsis elíptica, ovoide, obovada, obovado-elíptica, de dorso convexo, embrión ovalado a circular, hilo breve, sublinear a linear. Flores cleistógamas aéreas con estambres muy pequeños, intraestigmáticos, con lodículas muy reducidas o ausentes. En la base de los nudos de los escapos floríferos es frecuente la presencia de espiguillas cleistógamas. Los antecios son muy parecidos a los aéreos, aunque a veces carecen de arista dorsal o la tienen muy reducida y faltan las lodículas. Las espiguillas de las Vainas basales no poseen ni glumas ni lodículas. Están formadas por la lema y la pálea, las cuales son generalmente coriáceas, muy brillantes y lisas. La cariopsis es asimétrica y muy comprimida dorsiventralmente. El conjunto está envuelto por un profilo que puede ser liso y brillante, o con la superficie cubierta por grandes papilas, venas notorias, o por numerosos pelos.

Especie tipo: ***Danthonia spicata*** (L.) P.Beauv. ex Roemer & Schultes.

Etimología: género dedicado a Etienne Danthoine, botánico francés de fines del siglo 18.

Distribución: género principalmente distribuído en el Hemisferio Sur, encontrándose en América, Australia, Nueva Zelandia y Africa del Sur.

Clave para la determinación de las especies

1	Lema glabra en el dorso y márgenes	10. ***D. chilensis*** var. ***glabriflora***
–	Lema pilosa en el dorso y márgenes, o sólo en los márgenes	2
2	Lema pilosa en el dorso y márgenes	3
–	Lema pilosa sólo en los márgenes	22
3	Los pelos del dorso no alcanzan la inserción de la arista dorsal	4
–	Los pelos del dorso alcanzan la inserción de la arista dorsal	9
4	Innovaciones extravaginales	5
–	Innovaciones intravaginales	6
5	Espiguilla terminal de 7–9,2 mm de longitud	6. ***D. chaseana***
–	Espiguilla terminal de 19–31 mm de longitud	22. ***D. rhizomata***

6 Glumas mayores que el conjunto de los antecios 7
– Glumas menores que el conjunto de los antecios 8
7 Lóbulos de la lema de 7,4–12,5 mm de largo, pálea de 6–8,5 mm de longitud 15. ***D. domingensis*** subsp. ***obtorta***
– Lóbulos de la lema de 2,8–5(–5,5) mm de largo, pálea de 4–5 mm de longitud 2. ***D. araucana***
8 Láminas de 3–6 mm de ancho, cubiertas de aguijones en ambas superficies 16. ***D. domingensis*** subsp. ***shrevei***
– Láminas de 0,8–2,5(–3) mm de ancho, con aguijones sólo en los márgenes de la superficie abaxial 14. ***D. domingensis*** subsp. ***domingensis***
9 Innovaciones extravaginales 10
– Innovaciones intravaginales 13
10 Lóbulos de la lema múticos, o con aristas menores de 1 mm 11
– Lóbulos de la lema no múticos, aristas de (1,8–)2,5–6 mm 12
11 Panícula con 1–2 espiguillas, un entrenudo por caña 1. ***D. annableae***
– Panícula con 7 o más espiguillas, 2–4 nudos por caña 3. ***D. breviseta***
12 Los pelos del callo no alcanzan a llegar a la zona media de la lema, son menores de 3 mm *20.* ***D. montevidensis***
– Los pelos del callo llegan a la zona media de la lema, son mayores de 3 mm 25. ***D. secundiflora*** subsp. ***mattheii***
13 Escapo floral pubescente 15. ***D. domingensis*** subsp. ***obtorta***
– Escapo floral glabro 14
14 Pálea ovada 15
– Pálea lanceolada u obovada 16
15 Panícula cerrada, hojas basales cortas 27. ***D. spicata***
– Panícula abierta, hojas basales largas 12. ***D. compressa***
16 Largo desde la base de la lema (sin incluir el callo) hasta la inserción de la arista dorsal mayor de 5 mm. 21. ***D. parryi***
– Largo desde la base de la lema (sin incluir el callo) hasta la inserción de la arista dorsal menor de 5 mm 17
17 Base de la arista dorsal café oscura a negra 19. ***D. melanathera***
– Base de la arista dorsal café clara 18
18 Los pelos de la lema no alcanzan el ápice de la pálea 2. ***D. araucana***
– Los pelos de la lema alcanzan el ápice de la pálea 19
19 Pálea pilosa en los bordes 7. ***D. chiapasensis***
– Pálea glabra en los bordes 20
20 Pálea y glumas lanceoladas 18. ***D. malacantha***
– Pálea obovada, glumas linear-lanceoladas 21
21 Largo desde la base de la lema (sin incluir el callo) hasta la inserción de la arista dorsal de1,8–3 mm 11. ***D. cirrata***
– Largo desde la base de la lema (sin incluir el callo) hasta la inserción de la arista dorsal de 3,5–4,5 mm 26. ***D. sericea***
22 Arista dorsal ausente, hay solamente un mucrón 13. ***D. decumbens***
– Arista dorsal presente 23
23 Panícula cerrada, pedicelos cortos 24
– Panícula abierta, pedicelos largos 25
24 Pálea ovada, de 2,8–4 mm de largo, callo de 0,2–0,3 mm 27. ***D. spicata***
– Pálea lanceolada, de 4–7 mm de largo, callo de 0,5–1 mm 17. ***D. intermedia***
25 Los pelos del callo sobrepasan la inserción de la arista dorsal 23. ***D. secundiflora*** subsp. ***secundiflora***
– Los pelos del callo no sobrepasan la inserción de la arista dorsal 26
26 Pálea igual o mayor de 7 mm de largo 27
– Pálea menor de 7 mm 29

27 Hojas basales glabras 4. ***D. californica*** var. ***californica***
– Hojas basales pilosas 28
28 Panícula con 1–2 espiguillas, la mayoría con una sola espiguilla, lóbulos de la lema con aristas de 0,2–2 mm, plantas de pequeño tamaño 28. ***D. unispicata***
– Panícula con (1–)2–5(–7) espiguillas, la mayoría con 2–5 espiguillas, lóbulos de la lema con aristas de (1–)2–6 mm, plantas de gran tamaño 5. ***D. californica*** var. ***americana***
29 Vainas pilosas 9. ***D. chilensis*** var. ***aureofulva***
– Vainas glabras 30
30 Pálea con pelos cortos en el dorso, espiguilla terminal menor de 10 mm 6. ***D. chaseana***
– Pálea glabra, espiguilla terminal igual o mayor de 10 mm 31
31 Gluma superior 6, 8, 9-nervada, pálea oblanceolada 24. ***D. secundiflora*** subsp. ***charruana***
– Gluma superior 3, 5-nervada, pálea elíptica 8. ***D. chilensis*** var. ***chilensis***

Descripciones

1. ***Danthonia annableae*** P.M.Peterson & Rúgolo, Madroño 40(2): 71. 1993. **Holotypus**: Bolivia. Potosí, approximately 18 km NW of Salo on road to Atocha, 21.3.1992, *Peterson & Annable 11832* (SI; Iso: FR, K, LPB, MO, TAES, US).

Icon: PETERSON & RÚGOLO 1993, fig. 1.
Fig. 9: A–B

Cañas floríferas 1-nodes, de 3–15 cm de altura. Innovaciones extravaginales. Hojas basales de hasta 6 cm de largo, pilosas ralas. Vainas glabras, con mechones de pelos de hasta 2,5 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,4–1 mm. Láminas con pelos ralos en los bordes involutados, de hasta 4,5 cm de largo por 0,6–1 mm de ancho. Panícula de 1,3–2,3 cm de largo, con 1–2 espiguillas. Pedicelos pilosos, de 1–5 mm de longitud. Espiguillas 4–6-floras, sin considerar el último antecio que es estéril, erectas, la terminal de 12–17 mm. Artejos de la raquilla glabros, menores de 1 mm. Glumas violáceas, márgenes hialinos, lanceoladas, 5-nervadas, la inferior de 10–17 mm, la superior de 10–16 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 7,5–8 mm y desde el callo hasta el ápice de la arista dorsal de 10,5–14 mm, callo piloso, de 0,6–0,7 mm, pelos de 0,5–2 mm, arista dorsal de 6,5–10 mm de longitud. Lema pilosa en el dorso y márgenes, los pelos del dorso alcanzan la inserción de la arista dorsal y miden hasta 2,5 mm de longitud. La lema mide desde su base (sin incluir el callo) hasta la inserción de la arista dorsal 3,5–4 mm. Lóbulos laterales de 2,9–3,2 mm, terminando en un pequeño mucrón o con aristas menores de 0,5 mm. Pálea elíptica, de 5,8–6,6 × 1,8–2 mm, finamente ciliada en los márgenes, el resto glabro, ápice obtuso a truncado, raramente emarginado. Lodículas 2, cuneadas, de 0,5–0,7(–1,5) mm, glabras, raro pilosas, cuando pilosas, los pelos miden hasta 0,5 mm. Estambres 3, anteras de 0,8–2,5 mm. Ovario de 0,8–1,2 mm de largo. Estigmas de 2–3 mm de longitud. Cariopsis elíptica, café amarillenta, de 2,5–2,8 × 0,9–1,4 mm. Embrión de 1–1,3 mm. Hilo de 0,5–0,7 mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,2–0,5 mm, lodículas presentes. Espiguillas cleistógamas axilares presentes, unifloras. Brácteas basales de 8 mm de largo, márgenes finamente ciliados, con el ápice biaristado, aristas de 1,7–1,8 mm de largo. Lema pilosa en el dorso, de 5,5–8,5 mm de largo, con lóbulos laterales de 1,5 mm, arista dorsal de 4,5 mm. Pálea de 5 mm, membranácea, márgenes finamente

ciliados. Anteras de 0,3–0,5 mm. Ovario de 1 mm. Espiguillas cleistógamas en las vainas basales no observadas.
Distribución: especie endémica de Bolivia. Ha sido colectada únicamente en los alrededores de Tupiza.
Hábitat: crece sobre pizarras, a altitudes de hasta 3900 m.

Material estudiado:

Bolivia. Potosí: Sud Chichas, 17 km W of Tupiza. Dry stony slopes near power lines, 8.4.1992, *Renvoize, Flores & Peca 5303* (K).

Especie relacionada a *D. cirrata* y *D. malacantha*, debido fundamentalmente a la pilosidad de la lema. En relación a su hábito se acerca mucho a *D. unispicata*, ya que ambas presentan una panícula con 1–2 espiguillas.

2. ***Danthonia araucana*** Phil., Anal. Univ. Chile 94: 31. 1896. **Holotypus**: Chile. In sylva Araucariarum montium Nahuelbuta, januario 1877 legimus, *F. Philippi s.n.* (SGO!).

Icon: DERTSCHENY 1989.
Fig. 9: C–D

Cañas floríferas (1–)2–4-nodes, de 6–40 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 13 cm de largo, pilosas a pilosas ralas, nunca glabras. Vainas pilosas a pilosas ralas, muy raro glabras, con mechones de pelos de hasta 3 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,2–1 mm. Láminas pilosas a pilosas ralas, muy raro glabras, de hasta 8 cm de largo por 1–2 mm de ancho. Panícula de 1,4–6,8 cm de largo, con (1–)2–8(–10) espiguillas. Pedicelos pubescentes, de 0,5–12 mm de longitud. Espiguillas 4–8-floras, sin considerar el último antecio estéril, la terminal de 12–19 mm. Artejos de la raquilla glabros, de 0,3–0,8 mm. Glumas café violáceas a verdosas, márgenes hialinos, lanceoladas, 5-nervadas, la inferior de 7,5–15 mm, la superior de 7–14 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 7–9,5 mm y desde el callo hasta el ápice de la arista dorsal de 10–15 mm, callo piloso, de (0,5–)0,7–1 mm, pelos de 0,3–1,5 mm, arista dorsal de 6–11 mm de longitud. Lema pilosa en el dorso y márgenes, los pelos del dorso no alcanzan el ápice de la pálea y miden de 0,8–1,2(–2) mm, los laterales miden de 0,8–1,5 mm. La lema mide desde su base (sin incluir el callo) hasta la inserción de la arista dorsal 3–3,5(–4) mm. Lóbulos laterales de 2,8–5(–5,5) mm, con aristas de 0,5–2,5(–3) mm, a veces sólo hay un mucrón, pero es raro. Pálea lanceolada, de 4–5,5 × 1–1,6 mm, finamente ciliada en los márgenes, el resto glabro, ápice obtuso, agudo o bidenticulado. Lodículas 2, cuneadas, de (0,3–)0,5–0,8 mm, glabras, raro pilosas, cuando pilosas, los pelos son menores de 0,5 mm. Estambres 3, anteras de 1,5–3 mm. Ovario de 0,5–1(–1,5) mm de longitud. Estigmas de (0,6–)1–2,5 mm. Cariopsis elíptica, café clara, de 1,6–2,5 × 0,6–1 mm. Embrión de 0,7–1 mm. Hilo de 0,5–0,8 mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,3–0,5 mm, lodículas presentes. Espiguillas cleistógamas axilares presentes, unifloras. Brácteas basales de 4–4,5 mm, márgenes finamente ciliados. Lema de 5–5,5 mm, membranácea, glabra, lóbulos laterales y arista dorsal ausentes. Pálea de 3,7–4 mm, membranácea, márgenes finamente ciliados. Anteras de 0,2–0,3 mm. Cariopsis alargada, café oscura, de 2,3–2,4 × 0,5–0,6 mm. Embrión de 0,7–0,8 mm. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de 2,5–5,5 mm, coriáceo, apiculado, con el dorso cubierto de pelos y verrugas, márgenes finamente ciliados. Lema de 2,5–3,8 mm de

longitud, coriácea, glabra, lisa, brillante, apiculada. Pálea de 2,3–3 mm, membranácea, márgenes finamente ciliados, resto glabro, lisa, apiculada. Cariopsis elíptica, café clara, de 1,6–2,4 × 0,7–1,5 mm. Embrión de 0,6–1 mm. Hilo de 0,2–0,8 mm.
Distribución: especie endémica de Chile.
Hábitat: forma parte de praderas naturales, prefiere suelos duros, arcillosos, con fuerte exposición. Suele crecer incluso en plantaciones artificiales, nunca dentro del bosque sino en los márgenes.

Material citado seleccionado:

Chile. **VII Región**. Prov. Linares: Constitución, Quebrada Honda, II.1895, *R.A. Philippi s.n.* (SGO). – Prov. Maule: Camino de Cauquenes a Chanco, km 11, 11.1.1964, *Marticorena & Matthei 472 b* (CONC). – **VIII Región**. Prov. Arauco: Cordillera de Nahuelbuta, fundo El Porvenir, 800 m, 12.12.1983, *Matthei & Quezada 26* (CONC) – Loma del Consorcio, 925 m, 13.12.1983, *Matthei & Quezada 76* (CONC). – Prov. Biobío: Los Angeles, 30.12.1896, *Dusen s.n.* (S). – Prov. Concepción: Concepción, I.1952, *Kunkel 2027* (BAA) – Laguna Chica de San Pedro, entrada por camino a Santa Juana, 1.2.1989, *Baeza 185, 186* (CONC) – Predio Universitario, sector El Guindo, 7.12.1988, *Baeza 158 a* (CONC). – **IX Región**. Prov. de Malleco: Angol, camino de Angol a Vegas Blancas, 8.12.1988, *Baeza 159* (CONC) – Cordillera de Nahuelbuta, La Rinconada, entre Rucapillán y Angol, 795 m, 9.1.1985, *Matthei & Quezada 156* (CONC) – Parque Nacional Nahuelbuta, sector Piedra del Aguila, 800 m, 8.2.1991, *Devore & Baeza 1592* (CONC). – **X Región**. Prov. Valdivia: Huallihuapi, 930 m, II.1865, *F. Philippi s.n.* (SGO) – Huidif, 150 m, 26.12.1936, *Gunckel 12643 b* (CONC) – Huite in pascuis, I.1852, *Lechler 749 b* (FR) – Pampa de Huite, 23.11.1946, *Castillo s.n.* (CONC).

Especie muy afín al complejo *D. chilensis*, se diferencia por la lema pilosa en la base del dorso. A veces los pelos alcanzan a llegar hasta la inserción de la arista dorsal.

3. ***Danthonia breviseta*** Hackel, Oesterr. Bot. Z. 52(5): 192. 1902. **Holotypus**: Brasil. Brasilia, Rio de Janeiro, VII.1888, *Glaziou* 17361 (W!; Iso: B!, BR!, C!, G!, K!).
= *Danthonia macrophylla* Hackel, Oesterr. Bot. Z. 52(5): 193. 1902. Holotypus: Brasil. Brasilia, loco non indicato (verisimiliter prope Rio de Janeiro), V.1887, *Glaziou 16601* (W!; Iso: K!).

Icon: CONERT 1975, Abb. 4.
Fig. 8: I–J

Cañas floríferas 2–4-nodes, de 25–130 cm de altura. Innovaciones extravaginales. Hojas basales alcanzan longitudes mayores de 50 cm, glabras o pilosas ralas. Vainas pilosas o glabras, con mechones de pelos de hasta 3 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,3–0,5 mm. Láminas glabras o pilosas ralas en la superficie abaxial, cara adaxial siempre pilosa, alcanzando longitudes mayores de 50 cm por 3–5 mm de ancho. Panícula de 3,5–12,5 cm, con 7 a más de 100 espiguillas. Pedicelos glabros, de 1–20 mm. Espiguillas 3–5-floras, sin considerar el antecio terminal estéril, la terminal de 9–13(–16) mm. Artejos de la raquilla glabros, de 0,8–1 mm. Glumas café verdosas, lanceoladas, la inferior de 5,5–13 mm, 3-nervada, la superior de 4,5–11,5 mm, 3–5-nervada. Antecio inferior desde el callo hasta las aristas de los lóbulos de 5,3–6,8 mm y desde el callo hasta el ápice de la arista dorsal de 10–14 mm, callo piloso, de 0,5–0,7 mm, pelos de 0,3–1,5 mm, arista dorsal de 6–10 mm de longitud. Lema pilosa en el dorso y márgenes, los pelos del dorso sobrepasan la inserción de la arista dorsal y miden hasta 2,5 mm de largo. La lema mide desde su base (sin

incluir el callo) hasta el nacimiento de la arista dorsal 3–3,5 mm. Lóbulos laterales de 1,5–2,7 mm, terminando en un pequeño mucrón o con aristas de 0,3–0,8 mm de longitud. Pálea lanceolada, de 4–5,3 × 0,8–1,1 mm, márgenes ciliados, con pelos en el dorso de 0,3–0,6 mm desde la base hasta la zona medial, el resto glabro, ápice truncado o ligeramente bidenticulado. Lodículas 2, cuneadas, de 0,5–0,7 mm, glabras o pilosas, cuando pilosas, los pelos miden entre 0,2–0,5 mm de largo. Estambres 3, anteras de 2,2–3 mm. Ovario de 0,4–0,8 mm de longitud. Estigmas de 1,2–2 mm. Cariopsis elíptica, café clara, de 1,7–2 × 0,5–0,6 mm. Embrión de 0,6–0,7 mm. Hilo de 0,5–0,6 mm. Espiguillas cleistógamas no observadas.
Distribución: especie endémica de Brasil. Ha sido colectada únicamente en Brasilia.
Hábitat: de esta especie sólo se conoce el material typus, y HACKEL (1902) no describe las características del hábitat donde ésta crece.

Material estudiado:

Brasil. Brasilia: V.1887, *Glaziou 16601* (K, W); Rio de Janeiro, VII.1888, *Glaziou 17361* (B, BR, C, G, K, W).

CONERT (1975) considera a *D. macrophylla* como un sinónimo de esta especie, lo cual sin duda es efectivo. Este autor elige el nombre *D. breviseta* como válido debido a que se conserva material typus en buen estado y se especifica claramente el lugar de colecta.

4. ***Danthonia californica*** Boland. var. ***californica***, Proc. Calif. Acad. Sci. 2: 182. 1863. **Lectotypus**: On borders of cultivated fields near the bay at Oakland; hills near Mission Dolores, San Francisco, *Bolander 10* (GH). ≡ *Merathepta californica* (Boland.) Piper, Contr. U.S. Natl. Herb. 11: 122. 1906.

Icones: CRONQUIST et al. 1977, pág. 463; A.S. HITCHCOCK 1951, fig. 421; C.L. HITCHCOCK et al. 1969, pág. 544; MUNZ & KECK 1959, fig. 4 (a).
Fig. 3: F–H

Cañas floríferas 2–6-nodes, de 17–65 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 35 cm de largo, glabras. Vainas glabras, con mechones de pelos de hasta 4 mm a ambos lados de la lígula. Lígula pestañosa, con pelos de 0,2–1,5 mm. Láminas glabras, a veces presenta pelos muy ralos en la superficie adaxial, de hasta 18 cm de longitud por 1,5–4,5 mm de ancho. Panícula abierta, de 2,1–7,5 cm de largo, con (1–)2–5 espiguillas, la mayoría con 3 espiguillas. Pedicelos pubescentes, de 2–25 mm de longitud. Espiguillas 5–9-floras, sin considerar el último antecio que es estéril, la terminal de 15–24 mm. Artejos de la raquilla glabros, de 0,4–1 mm. *Glumas* café violáceas a verdosas, lanceoladas, 7–9-nervadas, la inferior de 9,5–24 mm, la superior de 9–24 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 8,5–15,5 mm y desde el callo hasta la inserción de la arista dorsal de 14,5–21 mm, callo piloso, de 0,5–1 mm, pelos de 0,5–2,5 mm, arista dorsal de 9–12 mm de longitud. Lema pilosa sólo en los márgenes, dorso glabro. La lema mide desde su base (sin incluir el callo) hasta la inserción de la arista dorsal 5–8,5 mm. Lóbulos laterales de 2,5–6,5 mm, con aristas de 1–4 mm de largo. Pálea lanceolada, de 7–10 × 2–3 mm, márgenes ciliados, resto glabro, ápice obtuso o agudo. Lodículas 2, flabeliformes, de 0,6–1(–1,8) mm, la mayoría glabras, cuando hay pelos, éstos miden de 0,2–1,6 mm. Estambres 3, anteras de 2,5–4 mm. Ovario de 1,5–2 mm de largo. Estigmas de 2,5–3 mm de longitud. Cariopsis elíptica, café clara, de 3–3,5 × 0,8–1,2 mm. Embrión de 1–1,5 mm. Hilo de 2–2,5 mm.

Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,2–0,6 mm, lodículas presentes. Espiguillas cleistógamas axilares presentes, 1–9-floras, de 6–90 mm de longitud. Brácteas basales de 7,5–10 mm, membranáceas, con los márgenes finamente ciliados. Artejos de la raquilla de (1–)3–10 mm, glabros o pilosos. Lema de 6–8,6 mm de largo, más o menos coriácea, apiculada, con lóbulos laterales de 0,5–0,6 mm, o ausentes, arista dorsal de 2–2,5 mm, o ausente. Pálea de 5–8 mm de largo, membranácea, apiculada, bicarenada, carinas finamente ciliadas. Anteras de 0,5 mm, o menores. Cariopsis alargada, café clara, de 3,5–4 × 0,8–1,2 mm. Embrión de 1–1,8 mm. Hilo de 1,5–3 mm. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de 5–7,5 mm, coriáceo, apiculado, con los márgenes ciliados, el resto glabro. Lema de 4,5–6,5 mm de longitud, coriácea, glabra, lisa, brillante, apiculada. Pálea de 4,5–6,5 mm de largo, membranácea, glabra, lisa, apiculada, envolviendo totalmente a la cariopsis. Cariopsis elíptica, café oscura, de 2,5–5 × 1–1,7 mm. Embrión de 1,5–2 mm. Hilo de 1,5–3 mm.
Distribución: Canadá y Estados Unidos.
Hábitat: praderas secas y húmedas y bosques abiertos, también suele encontrarse en riscos rocosos.

Material citado seleccionado:

Estados Unidos. California: Crystal Springs Lake, VI.1903, *Elmer 4707* (C, G) – Douglas Park, Del Norte County, 5.6.1928, *Thompson 4511* (K) – Hills near Berkeley, Alameda County, 400 ft, 21.4.1902, *Tracy 734* (G) – Near San Francisco, *Bolander 1533* (K) – North Coast Ranges, Eckert Ranch, Salt Point, Sonoma Coast County, 20.6.1942, *Hoffman 2045* (B) – Pacific Grove, 23.4.1910, *A. Chase 5645* (K) – San Luis Obispo, 9.5.1882, *Jones 3248* (BM) – Smith River, Darlingtonia Flats, Del Norte County, 400 ft, 5.5.1938, *Parks & Parks 24128* (B, BM, C, G, K, S) – Tiburon, Marin County, 8.5.1941, *Hoover 4992* (BAA, K). – Idaho: D'alene Mountains, 930 m, 26.6.1895, *Leiberg 1069* (K) – Indian Val, 2300 ft, 12.7.1899, *Jones 6615* (BM) – St. Anthony, 4.7.1901, *Merril & Wilcox 126* (K). – Montana: Gallatin Valley, near Bogeman, 5300 ft, 7.7.1896, *Hadman 92* (BM) – Spanish Basin, Madison Rouge, 6000 ft, 13.7.1896, *Hadman 94* (BM). – Oregon: 1881, *Howell s.n.* (BM) – Dry ground, 7 miles east of Mitchell, 9.7.1921, *Peck 10127* (K) – Saddle Mountain State Park, Clatson County, 15.7.1973, *Chambers 3807* (G).– Utah: Summit County, 8300 ft, 4.7.1926, *Payson & Payson 4878* (S). – Washington: Falcon Valley, Klickitat County, 12.7.1882, *Suksdorf s.n.* (BM) – Seattle, 12.6.1889, *C. Smith s.n.* (K) – Wet meadow along small stream 9 miles north of Troy, Asotin County, 30.6.1942, *Ownbey 2546* (S). – Wyoming: Fort Bridges, VII.1873, *Porter 20758* (BM) – Knowles Ranch, Crook County, 4200 ft, 28.6.1956, *Pase 614* (K).

Es considerada una especie con valor forrajero, sobre todo en California. El tamaño de la planta y la panícula pauciflora, con largos pedicelos, permiten diferenciar fácilmente a esta especie.

5. ***Danthonia californica*** Boland. var. ***americana*** (Scribner) Hitchc., Proc. Biol. Soc. Wash. 41: 160. 1928 ≡ *Danthonia grandiflora* Phil., Anales Univ. Chile 43: 568–569. 1873. **Holotypus**: Chile. Provincia de Ñuble, Chillán, XII.1869, *F. Philippi s.n.* (W!; Iso: SGO!), *non* Hochst. ex A. Rich., Tent. Fl. Abyss. 2: 418. 1851. ≡ *Danthonia americana* Scribner, U.S.D.A. Div. Agrostol. Rep. Agrostol. 30: 5. 1901. ≡ *Merathrepta americana* (Scribner) Piper, Contr. U.S. Natl. Herb. 11: 123. 1906.
= *Danthonia macounii* Hitchc., Amer. J. Bot. 2: 305. 1915. Holotypus: Canadá. Vicinity of Nanaimo, Vancouver Island, 4.7.1908, *Macoun 78825* (US).

Icon: ABRAMS 1955, fig. 393.
Fig. 3: I

Cañas floríferas 2–6-nodes, de 12–108 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 25 cm de largo, pilosas. Vainas pilosas, los pelos pueden alcanzar hasta 4 mm de longitud, muy raro glabras, con mechones de pelos de hasta 5 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,5–1(–3) mm. Láminas pilosas en ambas caras, muy raro glabras, de hasta 25 cm de largo por 1–4 mm de ancho. Panícula de 2,5–7,5(–8) cm de largo, muy abierta, con (1–)2–5(–7) espiguillas, la mayoría con 2–3 espiguillas. Pedicelos pubescentes, de 2–28(–60) mm. Espiguillas 4–10-floras, sin considerar el antecio terminal que es estéril, la terminal de 17–28 mm de longitud. Artejos de la raquilla glabros, de 0,4–1 mm de largo. Glumas violáceas a amarillentas, lanceoladas, (3–)5–9-nervadas, la inferior de 11–27,5 mm, la superior de 9–25,5 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 11–18 mm y desde el callo hasta el ápice de la arista dorsal de 15,5–25 mm, callo piloso, de 0,5–1 mm, pelos de 0,3–2(–2,3) mm, arista dorsal de 9–17 mm de longitud. Lema pilosa sólo en los márgenes, el dorso es glabro. La lema mide desde su base (sin incluir el callo) hasta la inserción de la arista dorsal 5–8 mm de largo. Lóbulos laterales de 4–9 mm, con aristas de (1–)2–6 mm de longitud. Pálea lanceolada, de 7–10 × 2–2,8 mm, márgenes ciliados, dorso y vientre glabros, ápice obtuso o agudo. Lodiculas 2, flabeliformes, de 0,6–1,5(–2,5) mm, glabras, raro pilosas, cuando pilosas, los pelos miden 0,1–1 mm de longitud. Estambres 3, anteras de 0,8–4 mm. Ovario de 1–2 mm de largo. Estigmas de 2–4 mm. Cariopsis elíptica, café clara, de 3–4 × 0,9–1,1 mm. Embrión de 1–1,8 mm. Hilo de 1–2,5 mm de longitud.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,3–0,5 mm, lodículas ausentes. Espiguillas cleistógamas axilares presentes, 1–7-floras, de 5–65 mm de longitud. Brácteas basales de 5–14 mm, membranáceas, con los márgenes ciliados. Artejos de la raquilla de 2,5–11 mm de largo, pilosos, raro glabros. Lema de 5–12 mm, algo coriácea, apiculada, con lóbulos laterales de 0,2–1 mm, o mucrones en la mayoría de los casos, arista dorsal de 0,8–4 mm, o ausente. Pálea de 4–10 mm de largo, membranácea, apiculada, bicarenada, finamente ciliada en los márgenes. Anteras de 0,3–0,6 mm. Cariopsis alargada, café clara, de 2–5 × 0,5–1,5 mm. Embrión de 0,8–2 mm. Hilo de 0,4–3 mm. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de 4,5–11 mm, coriáceo, apiculado, con los márgenes ciliados, el resto glabro, raro con verrugas en el dorso. Lema de 4,5–9 mm de longitud, coriácea, glabra, lisa, brillante, apiculada. Pálea de 3,5–7,5 mm, membranácea, glabra, lisa, apiculada, envolviendo totalmente a la cariopsis. Cariopsis elíptica, café oscura, de 2,5–4 × 0,9–2 mm. Embrión de 1–2 mm. Hilo de 0,7–2,8 mm.
Distribución: Canadá, Estados Unidos y Chile .
Hábitat: crece en praderas, en lugares abiertos, en el margen de los bosques de coníferas en el hemisferio norte. En Chile, habita suelos secos y duros y es constituyente de los espinales de *Acacia caven*.

Material citado seleccionado:

Canadá. British Columbia: Chilliwack Valley, 3500 ft, 22.7.1901, *Macoun 26080* (K) – Queen Charlotte Islands, near west and of Mosquito Lake along north shore, Moresby Island, 9.8.1964, *Calder & Taylor 36705* (B, G, K, M, S) – Vancouver Island, Vicinity of Victoria, 8.6.1893, *Macoun 149* (BM, K). – Quebec: Near International Boundary between Ketlle and Columbia Rivers, 30.6.1902, *Macoun 63331* (K).

Estados Unidos. California: Kinsey Ridge, south from Grouse Mt., 2 to 6 miles, 4200 ft, 11.8.1949, *Tracy 18475* (G) – Lake Almanor, Plumas County, 9.6.1946, *Hoffman 1812* (M)

– Northern Coast Ranges Larrabee Valley, 2300 ft, 21.6.1930, *Tracy 8772* (M) – Oakland, 1.5.1869, *Kellog & Harford 1106* (BM, G) – Sherwood, Mendocino County, 14.–16.7.1915, *Hitchcock s.n.* (B, BM, G, K, S) – Southern slope San Bernardino Mts., San Bernardino County, 4000–6000 ft, 29.–30.6.1895, *Parish 3790* (G) – Uriah Valley north of Uriah, 11.5.1941, *Hoover 5038* (K) – Valley of south Yager Creek, 2500 ft, 5.7.1926, *Tracy 7727* (M). – Idaho: Latah County, 1896, *Elmer s.n.* (G). – Montana: Bozeman, Gallatin County, 5 miles NE, 30.6.1947, *Booth 1565* (B) – Dry hillside above Crazy Head Spring, 8 miles east of Lame Deer, Rosebud County, 4350 ft, 26.7.1955, *Bennett s.n.* (G) – East of Bridger Range, Park County, 3.7.1940, *Swallen 6416* (K) – Forks of Madison, 7000 ft, 26.7.1897, *Rydberg & Bessey 3605* (G, K) – Missoula County, 5000 ft, 22.7.1933, *Hitchcock 1845* (K). – Oregon: 1871, *Hall 660* (BM, GOET) – Half mile south of Newberg, Benton County, 30.5.1964, *Hitchcock 23698* (G) – Near State School, 6 miles southeast of Salem, 25.5.1918, *Nelson s.n.* (B, BM, G, K, S). – Washington: Edge of a Meadow near Fulda, 20.7.1908, *Suksdorf 6304* (G) – Falcon Valley, Klickitat County, VI.1881, *Howell s.n.* (G, M) – Near Montesano, Chehalis County, 200 ft, 8.6.1898, *Heller & Heller 3908* (G). – Wyoming: Yellowstone National Park, Sylvan Geysers, 26.7.1899, *Nelson & Nelson 6164* (G).

Chile. **VII Región**. Prov. Linares: camino entre Chanco y Constitución, Lagunillas, 450 m, 11.1.1983, *Matthei & Bustos 22* (B, CONC), *25* (CONC). – Prov. Talca: Espinal de Los Llanos, 300 m, 27.11.1990, *Matthei & Quezada 1165* (CONC). – **VIII Región**. Prov. Concepción: Lado sur paso nivel Bulnes, 11.12.1987, *Baeza 49* (CONC). – Prov. Ñuble: Chillán, XII.1869, *F. Philippi s.n.* (SGO, W) – 1.6 km west of the Panamerican Hwy on the highway from Bulnes to Concepción, 16.11.1990, *Lammers, Baeza & Peñailillo 7951* (CONC). – **IX Región**. Prov. Malleco: Mininco, 187 m, 2.12.1972, *Montero 8812* (CONC).

Se diferencia de la variedad típica por la pilosidad de la vaina. Se trata de un carácter bastante estable, lo que permite definir la variedad.

6. ***Danthonia chaseana*** Conert, Senckenberg. Biol. 56(4/6): 308. 1975. **Holotypus**: Brasil. Brasilia, Minas Gerais, suumit of Pontão Crystal, 2798 m, dense tufts, mossy turf among rocks, 30.4.–4.5.1925, *A. Chase 9711* (F; Iso: FR!, MO!, NY).

Icon: CONERT 1975, Abb. 5.
Fig. 8: G–H

Cañas floríferas 2–4-nodes, de 15–37 cm de altura. Innovaciones extravaginales. Hojas basales de hasta 28 cm de largo, glabras, o con pelos muy ralos. Vainas glabras, con mechones de pelos de hasta 3,5(–5) mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,2–0,6 mm. Láminas glabras, de hasta 11 cm de largo por 0,8–1,2 mm de ancho. Panícula de 1,6–6 cm de largo, con 3–15 espiguillas. Pedicelos glabros, de 2,5–16,5 mm. Espiguillas 2–3-floras, sin considerar el ultimo antecio estéril, la terminal de 7–9,2 mm. Artejos de la raquilla glabros, de 0,7–1,2 mm de largo. Glumas café verdosas, lanceoladas, 3-nervadas, la inferior de 4–8 mm, la superior de 3,5–6,5 mm, mayores o iguales al conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 4,5–5,5 mm y desde el callo hasta el ápice de la arista dorsal de 6–8,5 mm, callo piloso, de 0,4–0,5 mm, pelos de 0,3–1,3 mm, arista dorsal de 3,5–5,3 mm de longitud. Lema pilosa en el dorso y márgenes, los pelos del dorso no llegan a la inserción de la arista dorsal y miden hasta 0,6 mm de largo, caedizos. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 2,2–3 mm. Lóbulos laterales de 1,2–2,8 mm, con aristas de 0,3–1,5 mm de longitud. Pálea lanceolada, de 3–4 × 0,6–0,8 mm, finamente ciliada en los márgenes, con pelos muy cortos en el dorso, los cuales aumentan en densidad hacia el ápice, ápice obtuso a truncado. Lodículas 2, cuneadas, de 0,4–0,6 mm, glabras. Estambres 3, anteras de

1,7–2,1 mm. Ovario de 0,6–0,8 mm. Estigmas de 0,8–1,2 mm. Cariopsis elíptica, café oscura, de 1,5–2 × 0,6–0,8 mm. Embrión de 0,7–0,8 mm. Hilo de 0,4–0,6 mm. Espiguillas cleistógamas no observadas.
Distribución: especie endémica de Brasil. Ha sido colectada únicamente en Serra do Caparaó.
Hábitat: crece entre rocas tapizadas de musgos. También en campos abiertos y secos, a altitudes superiores a los 2000 m.

Material estudiado:

Brasil. Minas Gerais: Brasilia, Serra do Caparaó, summit of Pontão Crystal, 2798 m, 30.4.–4.5.1925, *A. Chase 9711* (FR!, MO!) – Serra do Caparaó, 2000–2100 m, 30.4.–4.5.1925, *A. Chase 9727* (MO).

Especie pobremente colectada. Planta de pequeño tamaño, al igual que los antecios. Un carácter típico es la presencia de pelos en el dorso de la pálea, lo que es bastante raro dentro del género.

7. ***Danthonia chiapasensis*** Davidse, Novon 2(2): 100. 1992. **Holotypus**: México. Chiapas, on the SE side of Cerro Tres Picos and the ridges near summit, 2100–2500 m, 11.12.1972, *Breedlove & Thorne 30108* (DS!).

Fig. 6: G–I

Cañas floríferas 2–3-nodes, de 32–58 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 46 cm de largo, glabras. Vainas glabras, con mechones de pelos de hasta 2,5 mm a ambos lados de la lígula. Lígula pestañosa, con pelos de 0,5–1,5 mm. Láminas glabras a pilosas ralas, de hasta 23 cm de largo por 4 mm de ancho. Panícula de 8–14 cm de largo, con 30–60 espiguillas. Pedicelos pubescentes, de 0,5–6,5 mm de longitud. Espiguillas 4-floras, sin considerar el último antecio estéril, la terminal de 20–30 mm. Artejos de la raquilla glabros, de 0,8–1 mm de largo. Glumas café a violáceas, lanceoladas, acuminadas, de 15–22 mm de largo, la inferior 3-nervada, la superior 3, 5-nervada, mayores que el conjunto de los antecios. Antecio .inferior desde el callo hasta las aristas de los lóbulos de 14–16 mm y desde el callo hasta el ápice de la arista dorsal de 18–28,5 mm, callo piloso, de 0,7–0,8 mm, pelos de 0,5–1,5 mm, arista dorsal de 12–24 mm de longitud. Lema pilosa en el dorso y márgenes, los pelos alcanzan hasta 3,5 mm de largo, y sobrepasan la inserción de la arista dorsal. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 4–5 mm. Lóbulos laterales de 9,5–11 mm, con aristas de 5–7,5 mm. Pálea lanceolada, de 6–6,2 × 1–1,1 mm, con las carinas finamente ciliadas, los bordes inferiores presentan abundantes pelos de hasta 2 mm de largo, dorso glabro, ápice agudo a algo denticulado. Lodículas 2, cuneadas, de 0,7–0,9 mm, pilosas, los pelos miden 0,3–0,6 mm de largo. Estambres 3, con anteras de 2–3 mm de longitud. Ovario de 0,8–1 mm. Estigmas de 1,5–2,5 mm de largo. Cariopsis no observada. Espiguillas cleistógamas no observadas.
Distribución: endémica de México.
Hábitat: suele crecer en áreas abiertas en selvas bajas perennifolias (POHL & DAVIDSE 1994).

Material estudiado:

México. Chiapas: Municipio Villa Corzo, on the southeast side of Cerro Tres Picos and the ridges near summit, 2100–2500 m, 11.12.1972, *Breedlove & Thorne 30108* (DS).

Especie emparentada con *D. cirrata*, de la cual difiere por la presencia de lodículas siempre pilosas y los bordes de la pálea con largos cilios. Estos mismos caracteres permiten diferenciarla fácilmente de *D. montevidensis*, *D. melanathera* y *D. sericea*.

8. ***Danthonia chilensis*** E.Desv. var. ***chilensis***, in Gay, Fl. Chil. 6: 360, lám. 80. 1854. **Holotypus**: Chile. Chili austral, envoyé par *M. Gay* (P; Iso: W!).
= *Avena ariguensis* Steud., Syn. Pl. Glumac. I: 233. 1854. Holotypus: Chile. Prope col. Arique, XII.1851, *Lechler 717* (SGO!; Iso: FR!, GOET!, K!, W!).

Icones: DERTSCHENY 1989; GAY 1854, lám. 80, fig. 3; NICORA 1973, fig. 1 (a–j); NICORA 1978, fig. 12; NICORA & RÚGOLO 1987, fig. 28.
Fig. 4: F–G

Cañas floriferas 2–5-nodes, de 6–43 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 16 cm de largo, pilosas ralas, a veces glabras. Vainas siempre glabras, con mechones de pelos de hasta 3 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,2–1 mm. Láminas glabras cara abaxial, pilosas cara adaxial, de hasta 12 cm de largo por 0,8–2 mm de ancho. Panícula de 1,2–5,5 cm de largo, con (1–)2–5(–8) espiguillas. Pedicelos pubescentes, de 1–14(–20) mm de longitud. Espiguillas 3–9-floras, sin considerar el último antecio estéril, la terminal de (10–)12–22 mm. Artejos de la raquilla glabros, de 0,4–0,8 mm. Glumas violáceas o verdosas, lineares, 3, 5-nervadas, la inferior de 6,5–16(–18,5) mm, la superior de 6–15(–17,5) mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 6,5–11 mm y desde el callo hasta el ápice de la arista dorsal de 10–19 mm, callo piloso, de 0,5–1 mm, pelos de 0,2–2, arista dorsal de 7–14 mm de longitud. Lema pilosa sólo en los márgenes, el dorso es glabro. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal (2,5–)3–4(–4,5) mm. Lóbulos laterales de 3–6,5 mm, con aristas de 1,5–4 mm, a veces hay únicamente un mucrón, pero es raro. Pálea elíptica, de 3,4–6(–6,5) × 1–1,5(–1,8) mm, finamente ciliada en los márgenes, el resto glabro, ápice agudo u obtuso. Lodículas 2, cuneadas, de 0,3–0,7 mm, glabras, raro ausentes. Estambres 3, anteras de 1,2–2,5 mm. Ovario de 0,6–1(–1,5) mm. Estigmas de 0,8–2,2 mm. Cariopsis elíptica, café clara, de 1,5–2,5 × 0,5–0,8 mm. Embrión de 0,5–1 mm. Hilo de 0,3–0,8 mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,2–0,5 mm, lodículas presentes, muy raro ausentes. Espiguillas cleistógamas axilares presentes, 1–2-floras, de 3,7–9,5 mm de longitud. Brácteas basales de 3,7–6,5 mm, unidas totalmente o sólo en la base, márgenes finamente ciliados. Artejos de la raquilla de 3,5 mm, o menores, glabros. Lema de 3–6,8 mm, coriácea, apiculada, glabra, brillante, lóbulos laterales ausentes, arista dorsal de 1 mm, o ausente. Pálea de 2,5–5 mm, más o menos membranácea, apiculada, márgenes finamente ciliados, el resto glabro. Anteras de 0,2–0,3 mm. Cariopsis alargada, café clara, de 1,5–2,8 × 0,4–0,7 mm. Embrión de 0,5–1 mm. Hilo de 0,2–0,5 mm. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de 3–5,5 mm, coriáceo, apiculado, cubierto de verrugas y pelos cortos, raro glabro, márgenes finamente ciliados. Lema de 2–4,5 mm, coriácea, glabra, lisa, brillante, apiculada. Pálea de 2–3,8 mm, membranácea, glabra, lisa, apiculada, envuelve casi completamente a la cariopsis. Cariopsis elíptica, café oscura, de 1,5–2,3 × 0,5–1,1 mm. Embrión de 0,6–1,2 mm. Hilo de 0,2–0,5 mm.

Distribución: Argentina y Chile.
Hábitat: forma parte de praderas naturales secas o húmedas. También ha sido colectada creciendo en ñadis en la provincia chilena de Valdivia. Prefiere suelos arcillosos y duros. Al igual que la var. *aureofulva* no alcanza en Chile casi nunca altitudes superiores a los 1000 m.

Material citado seleccionado:

Argentina. Prov. Neuquén: Depto. Lácar, Lago Lácar, Estación Forestal Pucará, 21.1.1965, *Rúgolo & Agrasar 268* (BAA).
Chile. Chili austral, envoyé par *M. Gay* (W). – **VII Región**. Prov. Cauquenes: Cordillera de la Costa, 450 m, 15.11.1958, *Schlegel 1783* (CONC). – Prov. Linares: Cordillera de Linares, *Ortega s.n.* (BAA, SGO). – Prov. Maule: Camino de Cauquenes a Chanco, km 11, 11.1.1964, *Marticorena & Matthei 472 a* (CONC). – **VIII Región**. Prov. Arauco: Colico, near Arauco Bay, 1914, *Calvert s.n.* (BM) – Curanilahue, 22.11.1929, *E. Barros 455* (BAA). – Prov. Biobío: Antuco, Malalcura, frente entrada a Abanico, 29.12.1990, *Baeza 227* (CONC) – Santa Bárbara, Cauñicú, 4.1.1991, *Baeza 230* (CONC). – Prov. Concepción: Concepción, 22.11.1922, *E. Barros s.n.* (CONC) – Lado sur paso nivel Bulnes, 11.12.1987, *Baeza 126* (CONC) – Tomé, 15.12.1936, *E. Barros 419* (BAA). – Prov. Ñuble: Camino de Quirihue a Cauquenes, fundo El Membrillo, 250 m, 1.11.1958, *Matthei 207* (CONC) – Palpal, camino Yungay a Bulnes, 200 m, 3.11.1946, *Pfister 7088* (CONC, SGO) – Talcamávida, 13.12.1950, *E. Barros 10008* (BAA). – **IX Región**. Prov. Cautín: Camino a Cajón, 150 m, 29.12.1941, *Gunckel 12571* (CONC) – Truf-Truf, 150 m, 10.12.1947, *Gunckel 17073* (CONC). – Prov. Malleco: Mininco, 190 m, 7.11.1943, *Montero 4048 a* (CONC). – **X Región**. Prov. Chiloé: Alerce Rosado, 14.2.1936, *Cabrera 3692* (BAA, BA, LP) – Chepu, 40 m, 17.1.1962, *Villagrán 3358* (CONC) – Isla Alao, entre la Capilla y Punta Apiao, 30 m, 13.1.1985, *Villagrán & Aguila 6025* (CONC) – Isla Nayahué, 10 m, 29.1.1985, *Villagrán & Aguila 6674* (CONC). – Prov. Llanquihue: Entre Llanquihue y Puerto Montt, 35 m, I.1941, *Pfister s.n.* (CONC) – Lago Chapo, 12.11.1990, *Baeza 204* (CONC) – Laguna Mansa, 120 m, 3.1.1951, *Pfister s.n.* (CONC). – Prov. Osorno: Contaco, 500 m, XII.1961, *Moller 9* (CONC) – Fundo 3 Esteros, 15.12.1940, *Rudolph 1079, 1080, 1081, 1082, 1083, 1086, 1088* (VALD) – Isla Fresia, Lago Puyehue, II.1956, *Levi 2956* (CONC) – Valle de Cayutue, Lago todos los Santos, 10.1.1945, *Rudolph 1084, 1085, 1087* (VALD). – Prov. Valdivia: Alrededores de Choroico, 100 m, 29.12.1936, *Montaldo 4372* (CONC) – Cerros del Bolsón, sur de Corral, 220 m, 10.12.1931, *Gunckel 2808 a* (CONC) – Corral, Cerro de la Marina, 50 m, 24.12.1935, *Gunckel 11851* (BAA) – Cuesta de Soto, 75 m, 9.12.1963, *Gunckel 41412* (CONC) – Huidif, 150 m, 26.12.1936, *Gunckel 12643* (BAA, S) – Isla Teja, 30 m, 10.12.1963, *Gunckel 41484* (CONC) – Lago Ranco, río Calcurrupe, 19.12.1944, *Boelcke 329* (BAA, SI) – Los Ulmos, 18.12.1979, *Hilldebrant 13* (VALD) – Niebla, 50 m, 11.2.1964, *Gunckel 41840* (CONC) – Prope col. Arique, XII.1851, *Lechler 717* (FR, GOET, K, SGO, W) – Quitaluto, 19.1.1931, *Gunckel 1917* (BAA, CONC) – Reumen, Pampa de Huite, 170 m, 26.1.1945, *Montero 4094* (BAA, CONC) – San Juan, II.1878, *F. Philippi s.n.* (K, LP, SGO).

Especie relacionada a *D. intermedia*, *californica* y *unispicata* debido a que la lema sólo posee pelos en los márgenes, el dorso es glabro. Sin embargo, estas especies son de mayor tamaño. Se diferencia del complejo *D. secundiflora* por poseer pelos del callo cortos.

9. ***Danthonia chilensis*** E.Desv. var. ***aureofulva*** (E.Desv.) C.M.Baeza, **comb. nov.**
≡ *Danthonia aureofulva* E.Desv., in Gay, Fl. Chil. 6: 362, lám. 80. 1854.
Holotypus: Chile. L'exemplare unique a été remis à *M. Gay* pour servir de modèle au Coloniste, Em. Desvaux, avril 1854. (P; Iso(fragmento): SGO!).

Icon: GAY 1854, lám. 80, fig. 2.
Fig. 4: I

Cañas floríferas (1–)2–4-nodes, de 6–40 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 12 cm de largo, muy pilosas. Vainas pilosas, con mechones de pelos de hasta 2 mm a ambos lados de la lígula. Lígula pestañoza, con pelos de 0,3–1 mm. Láminas pilosas, de hasta 11 cm de largo por 1–2 mm de ancho. Panícula de 1,5–5 cm de largo, con (1–)2–9 espiguillas. Pedicelos pubescentes, de 0,5–12 mm de longitud. Espiguillas 3–9-floras, sin considerar el último antecio estéril, la terminal de 10–22 mm. Artejos de la raquilla glabros, de 0,3–0,8 mm. Glumas dorado violáceas a café verdosas, lineares, 5-nervadas, la inferior de 7–17 mm, la superior de 6–16 mm, iguales, mayores o menores que el conjunto de los antecios, las de la espiguilla terminal casi siempre menores. Antecio inferior desde el callo hasta las aristas de los lóbulos de 6,6–12 mm y desde el callo hasta el ápice de la arista dorsal de 11–18,5 mm, callo piloso, de 0,6–1 mm, pelos de 0,2–1,8(–2,2) mm, arista dorsal de 7,5–11(–12,5) mm de longitud. Lema pilosa sólo en los márgenes, el dorso glabro. La lema mide desde su base (sin incluir el callo) hasta la inserción de la arista dorsal 3–4(–5) mm. Lóbulos laterales de 2,5–5,5(–6) mm, con aristas de 0,5–2,5(–3) mm, a veces sólo hay un mucrón, pero es raro. Pálea elíptica, de 4,2–6(–6,8) × 1–1,5(–1,8) mm, finamente ciliada en los márgenes, el resto glabro, ápice agudo, levemente bidenticulado, obtuso o algo truncado. Lodículas 2, cuneadas, de 0,4–0,7 mm, glabras. Estambres 3, anteras de 2–3 mm. Ovario de 0,5–1,2 mm. Estigmas de 1,2–2,5(–3) mm. Cariopsis elíptica, café clara, de 1,5–2,2 × 0,5–0,8 mm. Embrión de 0,5–1 mm. Hilo de 0,5–0,8 mm.
Cleistogamia: espiguillas cleistógamas aéreas ausentes. Espiguillas cleistógamas axilares presentes, 2-floras, de 8,5–10,5 mm de longitud. Brácteas basales de 6–9 mm, total o parcialmente unidas en la base, márgenes ciliados. Artejos de la raquilla de 3–3,5 mm, glabros. Lema de 5–7 mm de largo, coriácea, apiculada, lisa, brillante, lóbulos laterales ausentes, arista dorsal de 0,8–1,2 mm, o ausente. Pálea de 4–5 mm de largo, algo membranácea, apiculada, márgenes ciliados. Anteras de 0,3–0,4 mm. Cariopsis alargada, café clara, de 2,4–2,6 × 0,7–0,8 mm. Embrión de 0,8–0,9 mm. Hilo de 0,6–0,7 mm. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de 2–5 mm, coriáceo, apiculado, escamoso, con pelos tupidos de hasta 1 mm de largo, muchas veces con verrugas, márgenes ciliados. Lema de 2–3,8 mm, coriácea, glabra, apiculada. Pálea de 1,7–3 mm, membranácea, glabra, apiculada. Cariopsis elíptica, café clara, de 1,3–2 × 0,6–1,3 mm. Embrión de 0,5–1 mm. Hilo de 0,2–0,4(–0,6) mm.
Distribución: endémica de Chile.
Hábitat: crece en suelos arcillosos, con mucha exposición formando champas aisladas. No crece nunca a altitudes superiores a los 1000 m.

Material citado seleccionado:

Chile. Cordillere, X.1902, *Neger 14764* (M) – IV.1854, *Gay s.n.* (SGO!). – **V Región**. Prov. Valparaíso: Valparaíso, XI.1854, *F. Philippi s.n.* (BAA, SGO) – Quebrada Verde, 4.10.1936, *Garaventa 3233* (BAA) – Viña del Mar, Fundo 7 hermanas, 280 m, 29.10.1939, *Garaventa 3289* (BAA, CONC). – **VI Región**. Prov. Cardenal Caro: 7.2 km north of Bucalemu on the road to Cahuil, 235 m, 15.11.1990, *Lammers, Baeza & Peñailillo 7932* (CONC). – **VII Región**. Prov. Cauquenes: Camino de Cauquenes a Chanco, km 11, 30 m, 11.1.1964, *Ricardi, Marticorena & Torres s.n.* (CONC). – Prov. Talca: Cordillera de Talca, El Picazo, 28.12.1936, *E. Barros 395* (BAA). – **VIII Región**. Prov. Arauco: Trongol Bajo, 175 m, 27.12.1987, *Riquelme 140* (CONC). – Prov. Biobío: Los Angeles, 30.10.1896, *Dusen s.n.* (S). – Prov. Concepción: Bifurcación camino Chome a Rocoto, 6.12.1988, *Baeza 157* (CONC) – Camino viejo de Florida a Penco, 250 m, 7.11.1957, *Ricardi, Marticorena & Torres s.n.* (CONC) – Cerros La Toma, 20–100 m, 1.11.1935, *Montero 2495* (BAA, CONC) –

Concepción, Cerro Caracol, 200 m, 12.12.1941, *Pfister 371* (CONC) – Dichato, 20.11.1944, *E. Barros 4079* (BAA) – Hills above and behind the University of Concepción in recent forest, cutover hills, 100 m, 18.11.1990, *Taylor 10189* (CONC, MO) – Hualqui, Pichaco, 200 m, 24.10.1936, *Junge 5785* (CONC, SGO) – Laguna Chica de San Pedro, entrada por camino a Santa Juana, 9.12.1990, *Baeza 217* (CONC) – Penco, 6.11.1937, *E. Barros 436* (BAA) – Talcahuano, Isla Quiriquina, 20 m, 20.12.1950, *Ricardi s.n.* (CONC). – Prov. Ñuble: Camino Bulnes a Chillán, 1 km al norte del río Larqui, orilla de la carretera, 29.10.1987, *Inostroza, Figueroa & Gonzalez 165* (CONC) – Camino de Quirihue a Cauquenes, fundo El Membrillo, 250 m, 1.11.1958, *Matthei 202, 205, 206* (CONC) – Camino entre Cocharcas y San Nicolás, alrededores de San Pedro, 110 m, 11.1.1983, *Matthei & Bustos 7* (CONC) – Fundo El Porvenir, 250 m, 29.10.1975, *Rodríguez 672* (CONC) – 20 km of Chillán, and 1.4 km north of puente Larqui, on the Panamerican Hwy, 125 m, 16.11.1990, *Lammers, Baeza & Peñailillo 7942* (CONC). – **IX Región**. Prov. Cautín: Temuco, Truf-Truf, 125 m, 29.11.1957, *Montero 5690* (CONC). – Prov. Malleco: Angol, 2.5 km al este del Puente El Manzano, 22.1.1988, *Baeza 116* (CONC). – **X Región**. Prov. Osorno: Ñadi de Puyehue, I.1905, *R.A. Philippi s.n.* (SGO). – Prov. Valdivia: Corral, 50 m, 16.12.1932, *Gunckel 2808* (CONC) – Cordillera Pelada de Chaihuin, 480 m, 3.1.1932, *Gunckel 3067 b* (CONC) – Llancacura, 250 m, 21.12.1947, *Gunckel 17056* (CONC).

Se diferencia de la variedad típica por la pilosidad de la vaina y por el color fulveo dorado de las glumas. Las glumas muchas veces son menores que el conjunto de los antecios.

10. ***Danthonia chilensis*** E.Desv. var. ***glabriflora*** Nicora, Darwiniana 18: 82. 1973. **Holotypus**: Argentina. Neuquén, Isla Victoria, Puerto Radal, *Diem 278* (BAB; Iso: MVFA).

= *Danthonia calva* Phil., Anales Univ. Chile 94: 31. 1896. Typus: Chile. Habitat in Araucania, XI.1887 legi, *F. Philippi*.

Icon: NICORA 1973, fig. 1 (l–m).
Fig. 4: H, 10: C–F

Cañas floríferas 2–4-nodes, de 6–40 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 16 cm de largo, glabras. Vainas glabras, con mechones de pelos de hasta 2(–3) mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,3–0,5 mm. Láminas glabras, muy raro con pelos en la cara adaxial, de hasta 10 cm de largo por 0,8–2 mm de ancho. Panícula de 1,4–6 cm de largo, con 2–6(–8) espiguillas. Pedicelos pubescentes, de 1–12 mm de longitud. Espiguillas 4–9-floras, sin considerar el último antecio que es estéril, la terminal de 11–19 mm. Artejos de la raquilla glabros, de 0,5–0,7 mm. Glumas violáceas a café verdosas, lineares, la inferior de 6,5–17 mm, 5–nervada, la superior también de 6,5–17 mm, pero 3, 5-nervada, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 6–10 mm y desde el callo hasta el ápice de la arista dorsal de 9–15,5 mm, callo piloso, de 0,5–1 mm, pelos de 0,2–1 mm, arista dorsal de 6–10 mm de longitud. Lema glabra en el dorso y márgenes. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 3–4(–4,5) mm. Lóbulos laterales de 2,1–5(–5,5) mm, con aristas de 0,2–3,5 mm, a veces sólo hay un pequeño mucrón. Pálea elíptica, de 4–5,5 × 1–1,6 mm, márgenes finamente ciliados, el resto glabro, ápice obtuso, agudo, levemente bidenticulado o algo truncado. Lodículas 2, cuneadas, de 0,3–0,7 mm, glabras. Estambres 3, anteras de 0,8–2,5 mm. Ovario de 0,8–1 mm de largo. Estigmas de 1–2,5 mm de longitud. Cariopsis elíptica, café clara, de 1,3–1,6 × 0,5–0,8 mm. Embrión de 0,5–0,8 mm. Hilo de 0,4–0,8 mm.

Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,5–0,6 mm, lodículas presentes. Espiguillas cleistógamas axilares presentes, 1–4-floras, de 4–14 mm de longitud. Brácteas basales de 4–14 mm, unidas totalmente o sólo en la base, márgenes finamente ciliados. Artejos de la raquilla de 1–4,5 mm, glabros, raro pilosos. Lema de 3,6–8 mm, algo coriácea, apiculada, glabra, lisa, con lóbulos laterales menores de 0,5 mm, o ausentes, arista dorsal de 0,5–2 mm, o ausente. Pálea de 3,3–6 mm, membranácea, apiculada, márgenes ciliados, el resto glabro. Anteras menores de 0,5 mm. Cariopsis alargada, café clara, de 1,5–2,7 × 0,5–0,9 mm. Embrión de 0,6–1 mm. Hilo de 0,2–0,8 mm. Espiguillas cleistógamas en las vainas basales presentes, 1–2-floras. Profilo externo de 3–5,5 mm, coriáceo, apiculado, cubierto de verrugas y pelos, o totalmente glabro, márgenes ciliados. Lema de 2,5–4,7 mm de longitud, coriácea, glabra, lisa, apiculada. Pálea de 2–4 mm, membranácea, glabra, lisa, apiculada. Cariopsis elíptica, café clara, de 1,4–2,2 × 0,8–1,1 mm. Embrión de 0,7–1,1 mm. Hilo de 0,2–0,6 mm.
Distribución: Argentina y Chile.
Hábitat: crece en praderas naturales secas y en mallines.

Material citado seleccionado:

Chile. **X Región**. Prov. Chiloé: Piruquina, 25 m, 27.1.1932, *Junge s.n.* (CONC). – Prov. Llanquihue: Lago Chapo, en la playa cerca de la desembocadura del río Negro, 250 m, 22.1.1946, *Pfister 6283* (CONC) – Puerto Montt, 35 m, I.1941, *Pfister 308* (CONC). – Prov. Valdivia: Cerros del Bolsón, sur de Corral, 220 m, 10.12.1931, *Gunckel 2808 b* (CONC) – Esperanza, XII.1924, *Hollermayer 28* (CONC) – In pascuis pradii San Juan, XII.1852, *F. Philippi 314 b* (K) – Reumen, Pampa de Huite, 170 m, 26.1.1945, *Montero 4100* (CONC).

Se diferencia de las otras dos variedades por presentar la lema totalmente glabra. NICORA (1973) describe la variedad *glabriflora* para Argentina, sin hacer mención de *D. calva*, cuyos caracteres tanto morfológicos como biométricos son idénticos. En este trabajo la especie *D. calva* Phil. se sinonimiza a esta variedad.

11. ***Danthonia cirrata*** Hackel & Arechav., Anales Mus. Nac. Montevideo IV: 367. 1896. **Holotypus**: Uruguay. Montevideo, *Arechavaleta* (SGO!: fragm.).
= *Danthonia tandilensis* Kuntze., Rev. Gen. Pl. 3(3): 349. 1898. Holotypus: Argentina. Sierra de Tandil, XI.1892, *Kuntze* (LP).

Icones: ARECHAVALETA 1896, lám. XL; DERTSCHENY 1989; NICORA, 1973, fig. 1 (n–q); ROSENGURTT & ARRILLAGA 1963, lám. III; ROSENGURTT et al. 1970, pág. 48; SANTOS & CASTRO 1989, fig. 4; SMITH et al. 1982, pág. 465 (d–f).
Fig. 7: A–B

Cañas floríferas 1–4-nodes, de 7–75 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 22 cm de largo, glabras, pilosas o pilosas ralas. Vainas glabras, pilosas o pilosas ralas, con mechones de pelos de hasta 5 mm a ambos lados de la lígula. Lígula pestañosa, con pelos de 0,5–1 mm. Láminas glabras, pilosas o pilosas ralas, de hasta 12 cm de largo por 1–2 mm de ancho. Panícula de 2,5–10,6 cm de largo, con 3–52 espiguillas. Pedicelos pubescentes, de 0,5–14 mm de longitud. Espiguillas 6–11-floras, sin considerar el o los dos últimos antecios que son estériles, la terminal de 13–23 mm. Artejos de la raquilla glabros, de 0,2–0,5 mm. Glumas violáceas a café verdosas, linear-lanceoladas, la inferior de 11–23 mm, 3, 5–9-nervada, la superior de 10–21 mm, 3, 5–7, 9-nervada, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 8,2–14,5 mm y desde el callo hasta el ápice de la arista dorsal de 11,5–20 mm, callo piloso, de (0,5–)0,7–1 mm, pelos de

0,3–2(–3) mm, arista dorsal de 9–16 mm de longitud. Lema pilosa en el dorso y márgenes, los pelos alcanzan hasta 5 mm de largo, los pelos del dorso nacen sólo hasta el tercio superior de la lema y se distribuyen irregularmente en toda la superficie en una alta densidad. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 1,8–3 mm. Lóbulos laterales de 5–10,5(–12) mm, con aristas de 1,5–5(–6,5) mm. Pálea obovada, de 2,5–4,5(–5) × 1,2–2,3 mm, márgenes finamente ciliados, el resto glabro, ápice emarginado, obtuso o truncado. Lodículas 2, cuneadas, de 0,4–1 mm, glabras o pilosas, cuando pilosas, los pelos miden 0,1–0,5 mm. Estambres 3, anteras de 0,7–2,7 mm. Ovario de 0,5–1 mm. Estigmas de 1–2,5 mm. Cariopsis ovoide u obovoide, café clara, de 1,2–2 × 0,5–1 mm. Embrión de 0,5–0,8 mm. Hilo de 0,3–0,8 mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,2–0,3 mm, lodículas presentes. Espiguillas cleistógamas axilares no observadas. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de 5,5–10,5 mm, coriáceo, apiculado, con los márgenes pilosos, el resto glabro, ápice bidenticulado. Lema de 5–12 mm de longitud, coriácea a algo membranácea, glabra, raro con pelos cortos en los márgenes, lisa, apiculada. Pálea de 4,5–6,5 mm, dorso algo coriáceo, vientre membranáceo, márgenes finamente ciliados, el resto glabro, apiculada. Cariopsis elíptica, café clara, de 2,5–3 × 0,8–1,3 mm. Embrión de 0,9–1,5 mm. Hilo de 0,5–0,6 mm.
Distribución: Brasil, Bolivia, Uruguay y Argentina.
Hábitat: crece en terrenos pedregosos, áridos, grietas de piedras, campos vírgenes no anegables, turberas, campos arenosos y arcillosos.

Material citado seleccionado:

Brasil. Rio Grande Do Sul: Morro do Osso, prope Porto Alegre, 21.10.1949, *Rambo 44033* (FR, LP) – Mun. Peresópolis, Porto Alegre, 7.11.1892, *Lindman 307* (W) – Mun. Peresópolis, Porto Alegre, Morro da Policia, 19.11.1901, *Malme 598* (S) – Mun. Rio Pardo, 70 m, XI.1911, *Jürgens 6423* (W) – Mun. São Francisco de Paula, Frazenda Guirra, about 12 km from S. Francisco, on old road to Canela, 7.12.1979, *Pedersen 12642* (C) – Mun. São Gabriel, Serra Jaguarí, 9.11.1976, *Pedersen 11412* (C, MO). – Santa Catarina: Morro do Pinheiro Sêco, Lajes, 950 m, 1.11.1963, *Klein 4500* (B) – Taimbesinho, p. S. Fr. de Paula, 3.11.1954, *Rambo 55964* (B) – Sao Joaquim, Pericó, perto de Vacas Gordas, nas margens do Rio Lavatudo, 12.11.1964, *Mattos 12020* (SP).

Bolivia. Santa Cruz: Samaipata, auf steinigen Bergtriften, 1980 m, III.1911, *Herzog 1706* (S, W).

Uruguay. Depto. Artigas: Pintado, Ruta 30, 4.12.1957, *Rosengurtt B–6836* (BAA). – Depto. Canelones: Atlantida, 9.11.1913, *Osten 6918* (BA, S, W) – Fortín Santa Rosa, 20.12.1959, *Rosengurtt B-7757* (BAA, SI) – Toledo, 7.11.1928, *Osten 20090* (BAA). – Depto. Cerro Largo: río Negro, Estancia Palleros, 5.12.1937, *Gallinal et al. 1400* (BAA). – Depto. Florida: Arroyo Mansavillagra, Picada Castro, Estancia Rincón de Santa Elena, 6.11.1946, *Rosengurtt B–5746* (BAA) – Cerro Colorado, Estancia Las Rosas, Parcela La Chacra, 13.12.1936, *Gallinal et al. 365* (BAA) – Timote, Estancia Santa Clara, Parcela del Zipitria, 19.11.1934, *Gallinal 427* (BAA). – Depto. Maldonado: Abra de Perdomo, 21.11.1948, *Rosengurtt B–5266* (BAA) – Cerro Animas, 22.1.1948, *Rosengurtt B–5075* (BAA) – Punta Ballena, XII.1929, *Villega s.n.* (BAA). – Depto. Minas: Parque UTE, 6.12.1955, *Rosengurtt B–6375* (BAA). – Depto. Montevideo: Montevideo, *Arechavaleta s.n.* (SGO!) – Parque Lecocq, 27.10.1961, *Arrillaga 985* (BAA) – Punta Brava, río de La Plata, 12.11.1911, *Osten 5628* (CORD, SI) – Sayago, 30–40 m, XI.1925, *Herter 123* (G, M, S). – Depto. Rocha: Maravillas, 2–10 m, 15.–17.11.1948, *Herter 50521* (B, BAA). – Depto. Tacuarembó: Ruta 5 al norte de ruta a Clara, 6.12.1957, *Rosengurtt B-6928* (B). – Depto. San José: Sierra de Mal Abrigo, XI.1922, *Hauman s.n.* (BR).

Argentina. Prov. Buenos Aires: Estancia Sta Rita por Vela, 21.12.1908, *Stuckert 19739* (G, MO) – Mar del Plata, Playa Chica, 25.1.1932, *Hicken s.n.* (SI) – Pdo. Balcarce, Estación Experimental, Cerro del Tambo, 4.11.1958, *Grondona 2720* (BAA) – Pdo. Balcarce, Laguna La Brava, XI.1941, *Perez Moreau s.n.* (BA, BAA) – Pdo. Balcarce, Sierras, 27.1.1960, Nicora 6948 (BAA) – Pdo. Gral Pueyrredón, Ea. La Brava, Sierra Valdez, 18.11.1977, *Boelcke et al. s.n./Rugolo 781* (MO, SP) – Pdo. Saavedra, Cura Malal, 18.12.1899, *Spegazzini s.n.* (SI) – Pdo. Saavedra, Sierra de Brarard, Pigüé, 14.11.1932, *Parodi 10519* (BAA) – Pdo. Tandil, camino de Tandil a Balcarce, 5 km de Tandil, 31.10.1961, *Nicora s.n.* (BAA) – Pdo. Tornquist, Cerro Napostá, 19.11.1981, *Villamil 2014* (MO) – Pdo. Tornquist, Ea. Mamin-Co, cerro del potrero 35, 18.11.1981, *Villamil 2107* (MO, SP) – Vela, 31.12.1908, *Burees 19739* (W). – Prov. Córdoba: Depto. Calamuchita, 20 km northwest of Santa Rosa de Calamuchita, environs of Ahos Pampa, ca. 1000 m, 26.1.1974, *Conrad & Dietrich 2427* (MO). – Prov. Neuquén: río Negro, Nahuel Huapi, Cerro López, 27.–28.1.1945, *Perez Moreau s.n.* (BAA).

Especie muy afín a *D. malacantha*, y *D. sericea*. De la primera se diferencia por tener una mayor densidad de pelos en el dorso de la lema, como también por el menor tamaño de la pálea. De la segunda por el mayor tamaño de los lóbulos de la lema y de las aristas.

12. ***Danthonia compressa*** C.Austin, State Cab. Nat. Hist. 22(87): 54. 1869. **Holotypus**: Estados Unidos. Danube, Herkimer County, VII.1869, *Austin* (PH). ≡ *Merathrepta compressa* (C.Austin) Heller, Muhlenbergia 5: 120. 1909. ≡ *Pentameris compressa* (C.Austin) Nels. & Macbr., Bot. Gaz. 56(5): 469. 1913.
= *Danthonia alleni* C.Austin, Bull. Torrey Bot. Club 3(4): 21. 1872. Holotypus: Estados Unidos. Detected by Dr. Allen, at Rockaway L.I. (PH; Iso: NY).
= *Danthonia faxoni* C.Austin, Bull. Torrey Bot. Club 6(36): 190. 1877. Typus: Estados Unidos. New Hampshire, notch of the White Mountains, 3.11.1877, *Faxon s.n.*

Icones: BRITTON & BROWN 1896, fig. 398; DARBYSHIRE & CAYOUETTE 1989, fig. 2 (e–f); GLEASON 1952, pág. 158; A.S. HITCHCOCK 1951, fig. 417.
Fig. 8: D–F, 10: A–B

Cañas floríferas 3–6-nodes, de 15–88 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 40 cm de largo, glabras. Vainas glabras, con mechones de pelos de hasta 5 mm a ambos lados de la lígula. Lígula pestañosa, con pelos de 0,3–3(–5) mm. Láminas glabras, muy raras veces con pelos ralos en la superficie adaxial, de hasta 30 cm de largo por 1,5–3 mm de ancho. Panícula de 4–9,3 cm, muy abierta, con 2–11 espiguillas. Pedicelos pubescentes, de 1,5–31 mm de longitud. Espiguillas 5–8-floras, sin considerar el último antecio estéril, la terminal de 11–18 mm. Artejos de la raquilla glabros, de 0,8–1,2 mm. Glumas verdosas o violáceas, linear-lanceoladas, 5-nervadas, la inferior de 7,5–14 mm, la superior de 6,5–13 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de (4,5–)5–8,5 mm y desde el callo hasta el ápice de la arista dorsal de 9–14 mm, callo piloso, de 0,2–0,3 mm, pelos de 0,2–1 mm, arista dorsal de 6,5–10 mm. Lema pilosa en el dorso y márgenes, los pelos son muy cortos, pero alcanzan a llegar hasta la inserción de la arista dorsal. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 2,5–3,5 mm. Lóbulos laterales de (1,5–)2–4,6 mm, con aristas de 0,8–3 mm de longitud. Pálea ovada, de 3–3,5 × 0,8–1,3 mm, finamente ciliada en los márgenes, el resto glabro, ápice obtuso a truncado. Lodículas 2, cuneadas, de 0,2–0,6 mm, glabras, muchas veces faltan. Estambres 3, anteras de 1,5–2 mm. Ovario de 0,6–1 mm. Estigmas

de 1–2 mm. Cariopsis ovoide a elíptica, café oscura, de 1,5–2,4 × 0,5–1 mm. Embrión de 0,5–1 mm. Hilo de 0,3–0,6 mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,2–0,3 mm, lodículas ausentes, raro presentes. Espiguillas cleistógamas axilares presentes, 1–12-floras, de 7,5–42 mm de longitud. Brácteas basales de 4,8–9 mm, membranáceas, con los márgenes finamente ciliados. Artejos de la raquilla de 2–6(–8,5) mm, glabros o pilosos. Lema de 4,5–7,5 mm de largo, membranácea, con pelos ralos en el dorso, o glabra, márgenes finamente ciliados, con lóbulos laterales de 0,2–1,2, o ausentes, arista dorsal de 0,5–2(–4) mm. Pálea de 3,5–5 mm, membranácea, márgenes ciliados, el resto glabro. Anteras de 0,2–0,3 mm. Cariopsis alargada, café clara, de 2,2–3 × 0,5–0,8 mm. Embrión de 0,6–1 mm. Hilo de 0,4–0,5 mm. Espiguillas cleistógamas en las vainas basales presentes, 1–3-floras. Profilo externo de 5–8 mm, coriáceo, apiculado, con los márgenes finamente ciliados, el resto glabro. Lema de 3,5–5 mm, coriácea, glabra, brillante, apiculada. Pálea de 3,3–4 mm, dorso coriáceo, vientre membranáceo, márgenes ciliados, el resto glabro, apiculada. Cariopsis elíptica, café clara, de 2–3 × 0,7–1,5 mm. Embrión de 0,8–1,3 mm. Hilo de 0,3–0,5 mm.
Distribución: Canadá y Estados Unidos.
Hábitat: forma parte de praderas naturales húmedas y secas, también crece en bosques abiertos y en los márgenes de éstos.

Material citado seleccionado:

Canadá. Nova Scotia: North of Bridgetown, Annapolis County, 14.8.1940, *Dore 976* (K) – Shubenacache Lake, Halifax County, 12.7.1945, *Dore 45-479* (K). – Ontario: Ottawa, Riviere Rouge, Argenteuil County, 31.8.1947, *Dore 47-987* (K). – Quebec: East Broughton, comté de Beauce, sur les collines de serpentine, 10.8.1933, *Marie-Victorin, Rolland-Germain & Meilleur 44002* (BM) – Near Mansonville, 19.7.1934, *Dore 117* (K).

Estados Unidos. Georgia: Rabun County, 1100 ft, 6.7.1950, *Duncan 11219* (BM). – Kentucky. Whitley County, 28.5.1950, *Een s.n.* (S). – Maryland: Two miles SW of Laurel, 8.6.1958, *Sargent 7647* (S). – Massachusetts: East side of Horse Mountain, Hatfield, Hampshire County, 9.7.1978, *Ahles 85460* (M, SP) – Woodland border, area where Plain Road, crosses railroad, Hatfield, 7.7.1977, *Ahles 83626* (C). – New Hampshire: Nelson, 31.7.1932, *Foster s.n.* (S) – North Woodstock, 24.7.1917, *Fernald s.n.* (BM, C, G, K, S). – New York: Bronx Park, New York City, 19.6.1896, *Nash s.n.* (G) – Preston, 28.6.1886, *Coville s.n.* (K) – Town of Caroline, 1 mile north of Caroline Center, Tompkins County, 13.7.1919, *Eames & Wiegand 11330* (S). – North Carolina: Balds of Roan Mountain, IV.1883, *Curtiss 3541* (G, K, M) – Blowing Rock Mountain, Watauga County, 4000 ft, 23.6.1891, *Small & Heller s.n.* (S) – Summit of Mount Mitchell, Yancey County, 6711 ft, 25.8.1898, *Biltmore 3782 b* (S) – Transylvania County, 14.6.1974, *Boufford et al. 14262* (BM). – Pennsylvania: Between road and streamlet about 3/4 mile N by NE of Treichler Station, Lehigh County, 3.7.1927, *Pretz 12963* (C) – Ca. 1.5 km N of Kregar on PA Hwy 381, Westmoreland County, 570 m, 28.6.1980, *Uteh & Kiger 80-136* (BM) – 1.8 miles SW of Birdsboro, Berks County, 2.7.1932, *Brumbach 363-32* (C). – Tennessee: Mt. Le Conte, 5300 ft, 20.7.1934, *Kili 1219* (BM) – Olivera Lodge, Cades Cove, 22.–24.6.1931, *Swallen 1963* (B) – Roan Mountain, 26.7.1905, *Hitchcock s.n.* (B, BM, C, K). – Vermont: Bennington County, 19.7.1967, *Ahles 67723* (BM) – Near the Waterbury River, Vt., 25.8.1877, *Pringle s.n.* (BM, G). – Virginia: Vicinity of Marion, Smyth County, 2100 ft, 7.6.1892, *Britton, Britton & Vail s.n.* (G). – West Virginia: Cranberry Glades, Monongahela National Forest, Pocahontas County, 3400 ft, 14.8.1959, *Clarkson 3532* (B).

Especie muy emparentada con *D. spicata*, de la cual se diferencia por presentar una panoja muy abierta, con pedicelos muy largos, las aristas de los lóbulos de la lema son mayores, las láminas son normalmente de mayor longitud, como también su ancho.

13. ***Danthonia decumbens*** (L.) DC., in Lamarck & De Candolle, Fl. Franç., ed. 3,3: 33. 1805 ≡ *Festuca decumbens* L., Sp. Pl. 75. 1753. **Sintypus**: Europa. Anon. (LINN). ≡ *Sieglingia decumbens* (L.) Bernh., Syst. Verz. 20: 44. 1800. ≡ *Triodia decumbens* (L.) Beauv., Ess. Agrost. 76: 160. 1812.

Icones: BEDDOWS 1931, figs. 1–4; CONERT 1969, Abb. 1 (a–h), Taf. 1 (fig. 1), Taf. 2 (fig. 3); A.S. HITCHCOCK 1951, fig. 415; POHL 1980, fig. 55.
Fig. 3: D–E

Cañas floríferas 2–3-nodes, de 10–70 cm de altura. Innovaciones extravaginales. Hojas basales de hasta 25 cm de largo, pilosas ralas. Vainas pilosas, raro glabras, con mechones de pelos de hasta 3 mm a ambos lados de la lígula. Lígula pestañosa, con pelos de 0,5 mm. Láminas pilosas ralas en la superficie adaxial y con pelos en los márgenes, de hasta 10 cm de largo por 1,5–3,5 mm de ancho. Panícula cerrada, de 2–5 cm de largo, con 3–9 espiguillas. Pedicelos pubescentes, de 2–20 mm de longitud. Espiguillas 3–5-floras, sin considerar el antecio terminal que es estéril, la terminal de 7,5–11 mm. Artejos de la raquilla glabros, de 0,4–1 mm de largo. Glumas café violáceas a verdosas, lanceoladas, 5, 7-nervadas, la inferior de 6–11 mm, la superior de 6–9,5 mm, mayores o iguales que el conjunto de los antecios. Antecio inferior desde el callo hasta la zona terminal de 5–6,5 mm, no hay una arista dorsal típica sino únicamente un mucrón de 0,1–0,5 mm, los lóbulos laterales están reducidos notablemente y miden de 0,2–0,7 mm, aristas ausentes. Lema pilosa sólo en los márgenes, el resto glabro. Pálea ovada, de 4–5 × 1,6–2 mm, ciliada en los márgenes, el resto glabro, ápice levemente bidenticulado. Lodículas 2, cuneadas, muy membranáceas, de 0,2–0,3 mm, glabras, a menudo ausentes. Estambres 3, anteras cleistógamas de 0,2–0,3 mm. Ovario de 1,4–1,5 mm. Estigmas de 0,6–1 mm de longitud. Cariopsis elíptica, café clara, de 2–2,5 × 0,8–1,1 mm. Embrión de 0,7–1 mm. Hilo de 0,8–1 mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,2–0,3 mm, lodículas presentes o ausentes. Espiguillas cleistógamas axilares no observadas. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de 5–8 mm, coriáceo, apiculado, brilloso, con los márgenes finamente ciliados, el resto glabro. Lema de 4,5–8 mm, algo coriácea, glabra, apiculada. Pálea de 4–5,5 mm, membranácea, márgenes ciliados, el resto glabro. Cariopsis elíptica, café oscura, de 2,5–3,5 × 0,9–1,6 mm. Embrión de 0,7–1,5 mm. Hilo de 0,8–1,5 mm.
Distribución: Canadá, Estados Unidos y Costa Rica.
Hábitat: forma parte de praderas artificiales. Se le considera maleza en América, introducida desde Europa, donde ocupa una gran diversidad de hábitats, entre los cuales tenemos: praderas húmedas o secas, bosques claros, suelos ácidos y pobres, entre otros.

Material citado seleccionado:

Canadá. Newfounland: Eastern Avalon Peninsula, St. John's, 31.7.1911, *Fernald & Wiegand 4606* (C) – Rocky banks of Rennie's River, St. John's, 4.8.1894, *Robinson & Schrenk 206* (BM, C, K) – Shores of Conception Bay, Avalon Peninsula, 6.–7.8.1911, *Fernald & Wiegand 4607* (K, BM). – Nova Scotia: Halifax, Chebogue, Yarm County, 5.8.1940, *Dore 896* (K).

Costa Rica. Prov. Alajuela: Volcán Poás, meadow S of crater, 2400 m, 23.6.1982, *Pohl 14079* (K, MO). – Prov. Cartago: Upper slopes of Volcán Turrialba, ca. 3000 m, 8.8.1968, *Pohl & Davidse 10858* (K).

Esta especie presenta un alto grado de cleistogamia, siendo muy raro y difícil encontrar espiguillas casmógamas.

14. ***Danthonia domingensis*** Hackel & Pilger subsp. ***domingensis***, in I. URBAN, Symb. Antill. 6: 1. 1909. **Holotypus**: República Dominicana. Santo Domingo, Valle Nuevo, 2270 m, 29.5.1887, *Eggers 2227 b* (B!).
Icon: CONERT 1975, Abb. 1 (a–i).
Fig. 6: C–D

Cañas floríferas 2–4-nodes, de 20–80 cm de altura. Innovaciones intravaginales. Hojas basales filiformes, de hasta 80 cm de largo, glabras, los márgenes involutados cubiertos de aguijones. Vainas glabras, con mechones de pelos de hasta 3,5 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,4–1,2 mm. Láminas glabras, con los márgenes cubiertos de aguijones, de hasta 45 cm de largo por 0,8–2,5(–3) mm de ancho. Panícula de 5,5–13 cm de largo, a veces muy abierta, con 6–17 espiguillas. Pedicelos pilosos, de 1–28 mm de longitud. Espiguillas 3–7-floras, sin considerar el antecio terminal que es estéril, la terminal de 16–21 mm. Artejos de la raquilla glabros, de 0,5–1 mm. Glumas café violáceas a verdosas, linear-lanceoladas, 3, 5, 7-nervadas, la inferior de 6–11,5 mm, la superior de 6–11 mm, menores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 7,5–10,5(–12) mm y desde el callo hasta el ápice de la arista dorsal de 14–19(–21) mm, callo piloso, de 0,6–0,9 mm, pelos de 0,3–1,5 mm, arista dorsal plana, de 10–13(–15,5) mm de longitud. Lema pilosa en el dorso y márgenes, los pelos del dorso sólo crecen en el tercio inferior y miden hasta 1.5 mm de largo, no alcanzan a llegar hasta la inserción de la arista dorsal, los pelos del margen también miden hasta 1.5 mm de longitud. La lema mide desde su base (sin incluir el callo) hasta la inserción de la arista dorsal 3–5(–6) mm. Lóbulos laterales de 3,5–6,5 mm, con aristas de 1,5–3,5 mm. Pálea linear-lanceolada, de 4,2–6(–8,5) × 0,7–1(–1,3) mm, ciliada en los márgenes, a veces con pelos menores de 0,5 mm en la base del dorso, resto glabro, ápice agudo, bidenticulado o algo truncado. Lodículas 2, cuneadas, de 0,6–1 mm, glabras. Estambres 3, anteras de 2,8–3,5 mm. Ovario de 0,8–1,5 mm de largo. Estigmas de 2–3 mm de longitud. Cariopsis elíptica, café clara, de 1,4–2 × 0,7–1 mm. Embrión de 0,6–0,9 mm. Hilo de 0,3–0,5 mm. Espiguillas cleistógamas no observadas.
Distribución: Haití y República Dominicana.
Hábitat: crece en praderas naturales de altura formando champas aisladas, sobre caliza y en bosques abiertos de pinos.

Material estudiado:

Haití. Massif de La Selle, Marigot, Jardins Bois-Pin, towards Source-Cresson, ca. 2100 m, 8.6.1928, *Ekman 10048* (K, S) – Massif de La Selle, Morne de La Selle, 2400 m, 1.2.1925, *Ekman 3153* (K, S) – Massif de La Selle, Morne La Visite, at Roberjot, open slope of Morne La Visite, ca. 1600 m, 11.8.1924, *Ekman 1424* (S) – Morne La Visite, Pétionville, ca. 1850 m, 26.4.1926, *Ekman 5997* (C, K, S) – Peak La Selle, 24.12.1943, *Holdridge 1887* (BM).

República Dominicana. Prov. de Azua: Cordillera Central, Los Vallecitos del Yaque, ca. 2500 m, 3.10.1929, *Ekman 13659* (K, S). – Prov: de Barahona: Cordillera de Barahuco, Sierra de Los Comisarios, above 1800 m, 30.8.1926, *Ekman 6809* (S). – Prov. de La Vega: Loma Rosilla, 2500 m, VII.1912, *Fuertes 1776* (G, W) – Santo Domingo, Valle Nuevo, 2270 m, 29.5.1887, *Eggers 2227 b* (B) – Santo Domingo, prope Constanza, Valle Nuevo, 2200 m, VI.1910, *Türckheim 3414* (BR, G, K, M, W). – Prov. de Santiago: Cordillera Central, Monción, high ridge between río Magua and río San Juan, ca. 2000 m, 12.6.1929, *Ekman 12830* (S).

Se diferencia de la subsp. *shrevei* por poseer láminas muy delgadas y por la presencia de aguijones ubicados únicamente en la superficie abaxial.

15. ***Danthonia domingensis*** Hackel & Pilger subsp. ***obtorta*** (Chase ex Hitchc.) Conert, Senckenberg. Biol. 56 (4/6): 301. 1975 ≡ *Danthonia obtorta* Chase ex Hitchc., U.S.D.A. Misc. Circ. 243: 70. 1936. **Holotypus**: Haití. Massif de La Selle, Morne de La Selle, 2600–2680 m, 1.2.1925, *Ekman 3164* (US; Iso: C!, G!, K!, S!).

Icon: CONERT 1975, Abb. 1 (k).
Fig. 6: A–B

Cañas floríferas 2–4-nodes, de 21–56 cm de altura. Innovaciones intravaginales. Hojas basales filiformes, de hasta 41 cm de largo, glabras a pilosas ralas. Vainas glabras, con mechones de pelos de hasta 3,5 mm a ambos lados de la lígula. Lígula pestañosa, con pelos de 0,3–1 mm. Láminas glabras en la superficie abaxial, la adaxial glabra o con pelos cortos, de hasta 25 cm de largo por 0,8–1,5 mm de ancho. Panícula de 4,5–12,5(–17) cm de largo, con 4–19 espiguillas. Pedicelos pilosos, de 2,5–15(–20) mm de longitud. Espiguillas 3–5-floras, sin considerar el antecio terminal que es estéril, la terminal de 20–28 mm. Artejos de la raquilla glabros, de 0,8–1,2 mm. Glumas café violáceas a verdosas, linear-lanceoladas, 3, 5-nervadas, la inferior de 10,5–21 mm, la superior de 9,5–21 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 10,6–17 mm y desde el callo hasta el ápice de la arista dorsal de 18,5–24,5 mm, callo piloso, de 0,6–1 mm, pelos de 0,3–1,5 mm, arista dorsal geniculada, de 14–20,5 mm de longitud. Lema pilosa en el dorso y márgenes, los pelos del dorso llegan casi hasta la inserción de la arista dorsal o la sobrepasan y miden hasta 2 mm, los del margen también llegan hasta 2 mm de largo. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 3–5 mm. Lóbulos laterales de 7,4–12,5 mm, con aristas de 2–10 mm. Pálea linear-lanceolada, de 6–8,5 × 0,5–1,2 mm, finamente ciliada en los márgenes, el resto glabro, ápice bidenticulado. Lodículas 2, cuneadas a alargadas, de 0,6–1,3(–2,5) mm, glabras, raro con pelos, cuando pilosas, los pelos miden 0,2–0,5 mm. Estambres 3, anteras de 2,2–4 mm. Ovario de 0,8–1,5 mm de largo. Estigmas de 2–3,5 mm. Cariopsis elíptica, café clara, de 2–2,5 × 0,6–0,8 mm. Embrión de 0,8–1 mm de largo. Hilo de 0,6–0,8 mm. Espiguillas cleistógamas no observadas.
Distribución: Haití y República Dominicana.
Hábitat: crece sobre calizas y en acantilados a altitudes superiores a los 2000 m.

Material estudiado:

Haití. Massif de La Selle, Morne de La Selle, 2600–2680 m, 1.2.1925, *Ekman 3164* (C, G, K, S).
República Dominicana. Prov. de La Vega: Santo Domingo, Cordillera Central, Valle Nuevo, ca. 2400 m, 14.10.1929, *Ekman 13748* (S).

Esta subspecie es la única que presenta glumas mayores que el conjunto de los antecios, lo que permite diferenciarla fácilmente de las otras dos.

16. ***Danthonia domingensis*** Hackel & Pilger subsp. ***shrevei*** (Britton) Conert, Senckenberg. Biol. 56(4/6): 300. 1975. ≡ *Danthonia shrevei* Britton, Torreya 9(9): 210. 1909. **Holotypus**: Jamaica. Blue Mountains, Sir John's Peak, 2000 m, 7.5.1906, *Shreve s.n.* (NY).

Icon: CONERT 1975, Abb. 2.
Fig. 6: E–F

Cañas floríferas 2–4-nodes, de 32–77 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 35 cm de largo, cubiertas de aguijones en ambas caras. Vainas glabras a pubescentes, con mechones de pelos de hasta 2 mm a ambos lados de la lígula. Lígula pestañosa, con pelos de 0,2–0,5 mm. Láminas glabras a pubescentes en la superficie abaxial, la adaxial cubierta de aguijones, de hasta 35 cm de largo por 3–6 mm de ancho. Panícula de 8,5–13,5 cm de largo, con 18–32 espiguillas. Pedicelos pilosos, de 0,5–17 mm de longitud. Espiguillas 3–6-floras, sin considerar el último antecio que es estéril, la terminal de 18–27 mm. Artejos de la raquilla glabros, de 0,5–1 mm. Glumas café violáceas a verdosas, linear-lanceoladas, 9-nervadas, la inferior de 6,5–13 mm, la superior de 7–13 mm, menores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 11–14,8 mm y desde el callo hasta el ápice de la arista dorsal de 16–24 mm, callo piloso, de 0,8–1,2 mm, pelos de 0,3–1,5 mm, arista dorsal plana, de 11–19 mm de longitud. Lema pilosa en el dorso y márgenes, los pelos alcanzan hasta 1,5 mm de longitud, los del dorso no alcanzan a llegar hasta la inserción de la arista dorsal. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal (4–)4,5–5,5(–6) mm. Lóbulos laterales de 5,5–9 mm, con aristas de 3,5–6,5 mm de largo. Pálea linear-lanceolada, de 6–7,5 × 0,9–1,3 mm, finamente ciliada en los márgenes, dorso glabro o piloso, cuando hay pelos, éstos se ubican desde la base hasta un poco más arriba de la zona medial y miden hasta 0,7 mm, ápice truncado. Lodículas 2, cuneadas a alargadas, muy membranáceas, de 1–2,5 mm, glabras, a veces pilosas, cuando hay pelos, éstos miden de 0,1–0,3 mm. Estambres 3, anteras de 2–3 mm de largo. Ovario de 1–1,5 mm. Estigmas de 1,5–2,5 mm. Cariopsis elíptica, café clara, de 2,5–3 × 0,7–1 mm. Embrión de 0,7–1 mm de longitud. Hilo de 0,7–1 mm de largo. Espiguillas cleistógamas no observadas.
Distribución: endémica de Jamaica.
Hábitat: crece en laderas desprovistas de otro tipo de vegetación ocupando áreas considerables.

Material estudiado:

Jamaica. Blue Mountains, Sir John's Peak, 23.6.1907, *Harris 9600* (BM) – Blue Mountains, Sir John's Peak, 6000 ft, 24.1.1913, *Harris 11594* (K) – Sir John's Peak, above Cinchona, 2000 m, 22.3.1913, *Harris 11429* (B, BM, BR, C, G, K, S, W) – 2000 m, 10.6.1913, *Harris 11629* (B, BAA, BM, BR, C, G, K, S, W) – Sir John's Peak, Cinchona, 6000 ft, 18.6.1910, *Harris 10914* (BM).

Se diferencia de la subsp. *obtorta* por poseer glumas menores que el conjunto de los antecios, láminas anchas, cubiertas de aguijones en ambas superficies, y por ser la única del complejo que crece en Jamaica.

17. ***Danthonia intermedia*** Vasey, Bull. Torrey Bot. Club 10: 52. 1883. **Lectotypus**: Estados Unidos. California, Rocky Mountains, Plains of Br. America to Mt. Albert, Lower Canada, 26.7.1881, *Allen s.n.* (US; Iso: PH). ≡ *Merathrepta intermedia* (Vasey) Piper, Contr. U.S. Natl. Herb. 11: 122. 1906. ≡ *Pentameris intermedia* (Vasey) Nels. & Macbr., Bot. Gaz. 56(5): 470. 1913.

= *Danthonia canadensis* B.Baum & Findlay, Canad. J. Bot. 52(7): 1577. 1974. Holotypus: Canadá. British Columbia, common on grassy slopes at edge of Aspen bluff, 4.5 mi N of village of Ootsa Lake, 24.7.1954, *Calder & Savile 13503* (DAO; Iso: BM!, S!).

Icones: ABRAMS 1955, fig. 390; CRONQUIST et al. 1977, pág. 461; DARBYSHIRE & CAYOUETTE 1989, fig. 2 (g–h); GLEASON 1952, pág. 158; A.S. HITCHCOCK 1951, fig. 419; C.L. HITCHCOCK et al. 1969, pág. 546; WIGGINS 1980, fig. 894.
Fig. 3: A–C

Cañas floríferas 1–4-nodes, de 10,5–60 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 32 cm de largo, pilosas. Vainas glabras, raro pilosas, con mechones de pelos de hasta 4 mm a ambos lados de la lígula. Lígula pestañosa, con pelos de 0,5–3(–4) mm. Láminas pilosas, raro glabras, de hasta 20 cm de largo por 1–3 mm de ancho. Panícula cerrada, de 2–5,5 cm de largo, con 3–14 espiguillas. Pedicelos glabros a pubescentes, de 0,5–9 mm de longitud. Espiguillas 3–6-floras, sin considerar el último antecio que es estéril, la terminal de 12–19 mm. Artejos de la raquilla glabros, de 0,4–1 mm de largo. Glumas café violáceas a verdosas, lanceoladas, 3, 5-nervadas, la inferior de 10–18 mm, la superior de 9–16 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 5,4–8,5 mm y desde el callo hasta el ápice de la arista dorsal de 10,2–19 mm, callo piloso, de 0,5–1 mm, pelos de 0,5–3 mm, arista dorsal de 7–11 mm de longitud. Lema pilosa sólo en los márgenes, el dorso es glabro. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 3–4,5 mm. Lóbulos laterales de 1,8–3,6 mm, con aristas de 0,2–1 mm, muchas veces hay únicamente un pequeño mucrón. Pálea lanceolada, de 4–7 × 1,2–2 mm, finamente ciliada en los márgenes, el resto glabro, ápice agudo, bidenticulado, truncado u obtuso. Lodículas 2, cuneadas, de 0,4–1 mm, glabras. Estambres 3, anteras de 1–3,5 mm. Ovario de 0,8–1,2 mm de largo. Estigmas de 1–1,7 mm. Cariopsis elíptica, café clara, de 2–3 × 0,6–1 mm. Embrión de 1–1,5 mm. Hilo de 0,9–1,5 mm de longitud.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,3–0,5, lodículas presentes. Espiguillas cleistógamas axilares presentes, 3–7-floras, de 24–60 mm de longitud. Brácteas basales de 7,5–14 mm, algo coriáceas, con los márgenes finamente ciliados. Artejos de la raquilla de 3,5–13,5 mm, glabros o pilosos. Lema de 6,5–8 mm de largo, algo coriácea, apiculada, lóbulos laterales ausentes, arista dorsal de 0,5–3,5 mm, o ausente. Pálea de 5,5–7 mm, membranácea, apiculada, con los márgenes ciliados, el resto glabro. Anteras de 0,2–0,3 mm. Cariopsis alargada, café oscura, de 3–3,5 × 0,8–1 mm. Embrión de 1,4–1,6 mm. Hilo de 2–2,5 mm. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de 3,3–8 mm, coriáceo, apiculado, con los márgenes ciliados, el resto glabro. Lema de 3–6 mm de longitud, algo coriácea, glabra, lisa o con venas notorias, brillante, apiculada. Pálea de 2,8–4,5 mm, membranácea, márgenes finamente ciliados, el resto glabro, lisa, apiculada. Cariopsis elíptica, café clara, de 2–3 × 0,7–1,1 mm. Embrión de 1–1,5 mm. Hilo de 0,7–1,5 mm.
Distribución: Canadá y Estados Unidos.
Hábitat: crece en praderas naturales, turberas, terrenos abiertos, xéricos y oligotróficos, laderas rocosas.

Material citado seleccionado:

Canadá. Alberta: National Park Banff, Devil Head Lake, 18.8.1891, *Macoun s.n.* (BM) – Police Point Road, Cypress Hills Prov., 22.7.1980, *Aiken & Darbyshire 1484* (K) – West of Fenn, Stettler District, 5.8.1926, *Brinkman 2537* (BM). – British Columbia: Chilliwack Valley, 4000 ft, 12.7.1901, *Macoun 26079* (K) – Kicking Horse Lake, 18.7.1885, *Macoun s.n.* (K) – Mountain Nort of Griffin Lake, 5.8.1889, *Macoun s.n.* (C) – Queen Charlotte Islands, Head of Bigsby Inlet opposite Lyell Island, east coast of Moresby Island, 5.–6.7.1957, *Calder, Savile & Taylor 22150* (K, S) – Vancouver Island, Moat Lake, 3850 ft, 5.8.1961, *Calder & Mackay 32160* (K) – Vicinity of the mouth of Wicked River, 2000 ft, 31.7.1932, *Raup & Abbe 4260* (S). – Newfounland: Region of Bonne Bay, ca. 380 m,

Fernald & Wiegand 2596 (BM) – West Arm, Bonne Bay, 710 m, 17.8.1929, *Fernald, Long & Fogg, Jr. 1303* (BM, C, S). – Ontario: Algoma District, vicinity of Michipicoten Harbour, 21.7.1938, *Hosie, Harrison & Hughes 1570* (S) – Ottawa, Rocky Mountains, 3000 ft, 5.7.1887, *Macoun s.n.* (S). – Quebec: Gaspé County, Mt. Albert, 26.8.1947, *Dore 47-803* (K) – Gaspé County, Mt. Au Clair, Tabletop Mountains, ca. 1200 m, 10.8.1923, *Fernald & Smith 25477* (C). – Saskatchewan: Cypress Hills Park, 4000–4100 ft, 7.7.1947, *Breitung 4399* (G). – Yukon Territory: Canol Rd., east of upper Rose R., opposite mile 95, 17.7.1944, *Porsild & Breitung s.n.* (C) – Valley of Alsek River, about 1 mile east of Haines Road Junction, 26.10.1944, *Raup & Raup 12953* (S) – Valley slopes and mountain summits about 7 miles east of Little Atlin Lake, 13.8.1943, *Raup & Correll 11267* (S).

Estados Unidos. Alaska: Chugach Range, Tazalina Glacier, 2000–3000 ft, 19.7.1957, *Viereck & Viereck 2188* (S) – Kenai Peninsula, Summit Lake, IX.1960, *Hulten s.n.* (S). – Arizona: Entrance to Grand Canyon National Park, Kaibab Plateau, Coconino County, 8827 ft, 13.9.1968, *Howell & True 45260* (B). – California: Bubbs Creek Canyon, Vicinity of Vidette meadows, Fresno County, 9500–10000 ft, 22.7.1948, *Howell 24860* (G) – North Coast Ranges, Grouse Mountain, Humboldt County, 5000 ft, 18.7.1934, *Tracy 13421* (K) – Sierra Nevada, State Creek Basin, east of Mount Conness, Mono County, 3050 m, 26.8.1937, *Keck 4599* (C) – Yosemite National Park, 1866, *Bolander 6104* (G). – Colorado: Dead Lake, 3500 m, 30.7.1900, *Clements & Clements 444* (C, G) – Near Pagosa Peak, 12000 ft, VIII.1899, *Baker 164* (BM, G, K) – Pikes Peak, 26.8.1926, *Einer & Rietz 133:6* (S) – Ruxton Dell, 2950 m, 18.7.1901, *Clements & Clements 336* (C, G) – South Park, Jefferson, Park County, 3000 m, 17.8.1960, *Holmen, Porsild & Weber s.n.* (C). – Montana: Grantite Park, Glacier National Park, 13.7.1914, *Hitchcock s.n.* (B, BM, G, K) – Lookout Mountain, Clearwater Forest, 6500 ft, 25.8.1924, *Kirkwood 1978* (K) – Rocky Mountains, 1862, *Hall & Harbour 622* (G) – West of Elbow Lookout, near Lindbergh Lake, Missoula County, 4600 ft, 15.7.1955, *Cronquist 7927* (G, S). – New Mexico: Costilla Valley, Taos County, 4.9.1913, *Wooton s.n.* (K). – Oregon: Little Meadows, Chutes River, 1470 m, 1.8.1894, *Leiberg 605* (K) – Moist shade of the Wallowa Mountains, southern slope, 4000 ft, 28.6.1900, *Cusick 2227* (B, G, K) – Southern Blue Mountains, 19.7.1898, *Cusick 2047* (K) – West end of Pauline Lake, 2100 m, 30.7.1894, *Leiberg 593* (BM, C, K). – Utah. Fish Lake, 10000 ft, 10.8.1894, *Jones 5792* (BM, G). – South Dakota: Pennington County, 6400 ft, 6.8.1957, *Pase 863* (K). – Washington: Auf feuchten Wiesen des Mount Paddo, ca. 2000 m, 21.8.1907, *Suksdorf 691* (B, BM, C, FR, G, K, S) – Cascade Mountain, VIII.1928, *Grant s.n.* (B) – Mount Rainier, 1900 m, 30.8.1913, *Paulsen s.n.* (C) – Pullman, Olimpic Mountains, Clallam County, VIII.1900, *Elmer 1662* (C, G) – Rocky ledges below Austin Pass, Whatcom County, 4000 ft, 24.7.1930, *Thompson 5265* (BM). – Wyoming: East of Lacy's Creek, Yellowstone Park, 7500 ft, 10.8.1897, *Rydberg & Bessey 3602* (G, K) – Grand Teton National Park, 10000 ft, 14.8.1933, *Williams 1409* (S) – Jackson Hole, west side of Jenny Lake, 26.7.1926, *Hitchcock 23132* (BM) – Lower Libby Creek, 21.7.1938, *Goodding 208* (BM) – Shoshone National Forest, Park County, 2.8.1937, *Williams & Williams 3742* (G) – Snake River, Uinta County, 15.8.1899, *Nelson & Nelson 6459* (BM, G, K) – Yellowstone Park, 4.8.1885, *Letterman s.n.* (K).

La morfología del antecio es muy similar a *D. californica*. Sin embargo, la panícula contiene un mayor número de espiguillas, y la inflorescencia es muy cerrada.

18. *Danthonia malacantha* (Steud.) Pilger, Notizbl. Bot. Gart. Berlin-Dahlem 10: 759. 1929 ≡ *Trisetum malacanthum* Steud., Syn. Pl. Glumac. I: 424. 1853–1854. **Holotypus**: Chile. Huiti in pascuis, Jan. 1852, *Lechler 749* (P; Iso: FR!, G!, GOET!, S!).

= *Danthonia collina* Phil., Linnaea 29: 96. 1858. Holotypus: Chile. In pascuis apricis pradii San Juan, XII.1852, *F. Philippi 314* (SGO!; Iso: GOET!).

= *Danthonia octoflora* Phil., Anales Univ. Chile 94: 31. 1896. Holotypus: Chile. Habitat in Araucanía, novembri 1887, *F. Philippi s.n.* (P ?).
= *Danthonia oresigena* Phil., Anales Univ. Chile 94: 32. 1896. Holotypus: Chile. In prato montium Nahuelbuta prope Rucapillán legimus, I.1877, *F. Philippi s.n.* (SGO!).

Icones: DERTSCHENY 1989; SKOTTSBERG 1922, fig. 2 (a).
Fig. 7: C–D

Cañas floríferas 2–4-nodes, de 14–75 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 30 cm de largo, normalmente menores, pilosas. Vainas pilosas, raro glabras, con mechones de pelos de hasta 5 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,3–1(–1,5) mm. Láminas pilosas, de hasta 19 cm de largo por 1–2 mm de ancho. Panícula de 2,7–11(–18,5) cm de largo, con 4–24(–100) espiguillas. Pedicelos pubescentes, de 0,5–14 mm de longitud. Espiguillas 5–10-floras, sin considerar el último o los dos últimos antecios terminales que son estériles, la terminal de 15,5–28,5 mm de largo. Artejos de la raquilla glabros, menores de 0,5 mm. Glumas café violáceas a verdosas, lanceoladas, la inferior de 11–24 mm, 3, 5-nervada, la superior de 10,5–23 mm, 5-nervada, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 9–18,5 mm y desde el callo hasta el ápice de la arista dorsal de 14,5–23,5(–27) mm, callo piloso, de 0,8–1,2 mm, pelos de 0,2–2(–3) mm, arista dorsal de 10–18(–19,5) mm de longitud. Lema pilosa en el dorso y márgenes, los pelos del dorso sobrepasan la inserción de la arista dorsal y miden hasta 4 mm de largo. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 3–4(–4,5) mm. Lóbulos laterales de 5–10(–12,5) mm, con aristas de (1–)1,5–4(–5) mm. Pálea lanceolada, de 4,3–6(–8,5) × 1–2 mm, finamente ciliada en los márgenes, glabra, raro con pelos en el dorso, cuando hay pelos, éstos son muy cortos y escasos, ápice obtuso, truncado o bidenticulado. Lodículas 2, cuneadas, de 0,4–0,9 mm, glabras, raro pilosas, cuando pilosas, los pelos miden de 0,3–0,5 mm, a veces ausentes. Estambres 3, anteras de 0,7–4 mm. Ovario de 0,6–1(–1,5) mm. Estigmas de (1–)1,4–2,5(–3) mm de longitud. Cariopsis elíptica, café clara, de 1,7–2,5 × 0,7–1 mm. Embrión de 0,7–1,2 mm. Hilo de 0,3–0,8 mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,2–0,5 mm, lodículas presentes o ausentes. Espiguillas cleistógamas axilares no observadas. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de 4,2–7 mm, coriáceo, apiculado, con venas prominentes, márgenes finamente ciliados, el resto glabro. Lema de 3,3–6,4 mm, algo coriácea, glabra, lisa, brillante, apiculada. Pálea de 2,8–5,5 mm, membranácea, glabra, lisa, apiculada. Cariopsis elíptica, café clara, de 2–3 × 0,9–1,4 mm. Embrión de 0,9–1,5 mm. Hilo de 0,4–0,7 mm.
Distribución: endémica de Chile.
Hábitat: es constituyente de praderas naturales formando champas aisladas. Prefiere suelos secos, duros y arcillosos. También crece en fisuras sobre rocas. Es raro encontrarla creciendo a altitudes superiores a los 1000 m. En Juan Fernández suele crecer en los lomajes suaves de los cerros.

Material citado seleccionado:

Chile. **IV Región**. Prov. Choapa: Illapel, carretera panamericana, frente a estación Ingeniero Barriga, 35 m, 1.11.1974, *Marticorena, Matthei & R. Rodríguez 213* (CONC). – **V Región**. Prov. San Antonio: Camino de Algarrobo a Casablanca, 8 km de Algarrobo, 225 m, 11.11.1987, *Matthei & Quezada 338* (CONC). – Prov. Valparaíso: Juan Fernández, Más a Tierra, near Villagra, 200 m, 6.1.1917, *Skottsberg & Skottsberg 247* (BM, C, NY, S) – Juan Fernández, Más a Tierra, trail up to Mirador from San Juan Bautista, 460 m, 26.1.1990,

Stuessy, Stuessy, Crawford, Peñailillo & Baeza 11216 (CONC) – 3 km north of Laguna Verde on the coastal road from Valparaíso, 180 m, 2.11.1990, *Lammers, Baeza & Peñailillo 7790* (CONC). – **VI Región**. Prov. Cardenal Caro: 23 km east of Pichilemu, and 1 km east of Puente Los Valles N∞ 1, on the highway to Nancagua, 340 m, 15.11.1990, *Lammers, Baeza & Peñailillo 7878* (CONC). – **VII Región**. Prov. Cauquenes: camino de Chanco a Cauquenes, Estero Curanilahue, 11 km de Cauquenes, 200 m, 16.3.1988, *Baeza 124* (CONC) – Camino de Chanco a Cauquenes, frente a Reserva Forestal Los Ruiles, 17 km de Chanco, 200 m, 16.3.1988, *Baeza 123* (CONC). – **VIII Región**. Prov. Arauco: Contulmo, 3.11.1941, *Gunckel 12949* (BAA, CONC) – Curanilahue, 23.11.1937, *E. Barros 456* (BAA) – Quebrada del río Pilpilco, 160 m, 14.12.1983, *Matthei & Quezada 86* (CONC). – Prov. Biobío: Antuco, llano al norte del pueblo, 12.1.1941, *Junge 6942* (CONC, SGO) – Antuco, Malalcura, frente entrada a Abanico, 20.1.1988, *Baeza 110, 112* (CONC) – Camino de Nacimiento a Santa Juana, 5 km al norte de Nacimiento, 4.12.1990, *Baeza 213* (CONC) – Santa Bárbara, Cauñicú, 4.1.1991, *Baeza 230* (CONC). – Prov. Concepción: Bifurcación camino Chome a Rocoto, 6.12.1988, *Baeza 155, 156* (CONC) – Camino Concepción a Florida, 250 m, 9.12.1960, *Matthei 177* (CONC) – La Posada, 30.11.1937, *E. Barros 435* (BAA) – Laraquete, 23.9.1937, *E. Barros 439, 444* (BAA) – Parque Hualpén, 1.1.1941, *Gunckel 10054* (BAA, CONC) – Penco, 6.9.1937, *E. Barros 431* (BAA, G) – Talcahuano, Ramuntcho, 40 m, 3.12.1960, *Matthei 155* (CONC) – Talcahuano, Isla Quiriquina, 20 m, 20.11.1950, *Ricardi s.n.* (CONC). – Prov. Ñuble: Chillán, Bureo, 17.1.1921, *E. Barros 1586* (CONC). – **IX Región**. Prov. Cautín: Pillanlelbún, línea férrea sur, 165 m, 15.12.1963, *Montero 6778* (CONC) – Pitrufquén, río Toltén, 93 m, 8.12.1952, *Montero 4584* (CONC) – Temuco, Cerro Ñielol, 150 m, 16.12.1941, *Montero 4515* (CONC) – Truf-Truf, 150 m, 10.12.1947, *Gunckel 17070* (CONC) – Volcán Llaima, 1300 m, 28.–30.1.1942, *Gunckel 18777* (CONC) – Volcán Villarrica, 9.3.1941, *Gunckel 10836* (CONC). – Prov. Malleco: Angol, 10 km al este del Puente El Manzano, 8.12.1988, *Baeza 163* (CONC) – Angol, entre Angol y Vegas Blancas, 3 km de Angol, 3.12.1990, *Baeza 210* (CONC) – Cordillera de Lonquimay, 1700 m, *Hollermayer 469* (BAA, CONC) – Mininco, *Zöllner 74439* (Herbario particular O. Zöllner) – Vegas de Rucapillán, I.1877, *F. Philippi s.n.* (SGO). – **X Región**. Prov. Valdivia: Cordillera de Ranco in pascuis, XII.1854, *Lechler 3003* (GOET) – Huiti in pascuis, Jan. 1852, *Lechler 749 a* (FR, G, GOET, S) – In collibus apricis, San Juan, Januario, *F. Philippi 384* (W).

Es una especie bastante variable en cuanto a sus caracteres biométricos. PHILIPPI (1858, 1896) describe 3 especies de este complejo, basándose en el tamaño de los antecios. Sin embargo, luego de revisar una gran cantidad de material de herbario, como también al observar plantas en terreno, se pudo concluir que las variaciones en el tamaño no pueden ser delimitadas, no existiendo además caracteres morfológicos que permitan hacerlo. Las plantas que crecen en el archipiélago de Juan Fernández (Más a Tierra) presentan menor pilosidad que las que crecen en el continente.

19. ***Danthonia melanathera*** (Hackel) Bernardello, Kurtziana 10: 249. 1977 ≡ *Danthonia cirrata* Hackel & Arechav. var. *melanathera* Hackel, Anales Mus. Nac. Buenos Aires 7: 112. 1902. **Holotypus**: Argentina. Depto. Punilla, Capilla del Monte, 1200 m, 12.1.1907, *Estrada 16810* (Iso: G!, W!).

Fig. 7: G–H

Cañas floríferas 1–3-nodes, de (5–)9–32 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 20 cm de largo, pilosas. Vainas pilosas a pilosas ralas, con mechones de pelos de hasta 4 mm a ambos lados de la lígula. Lígula pestañosa, con pelos de 0,5–1 mm. Láminas casi glabras, con escasos pelos ralos, de hasta 8 cm de largo por 0,8–1 mm de ancho. Panícula de 1,9–5,3 cm de largo, con 1–4 espiguillas. Pedicelos

pubescentes, de 0,5–15 mm de longitud. Espiguillas 4–6-floras, sin considerar el último antecio estéril, la terminal de 18–30 mm. Artejos de la raquilla glabros, menores de 0,5 mm. Glumas café verdosas, linear–lanceoladas, la inferior de 15–30 mm, 5, 7-nervada, la superior de 14–29 mm, 7-nervada, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 14–18 mm y desde el callo hasta el ápice de la arista dorsal de 17–23 mm, callo piloso, de 0,9–1,2 mm, pelos de 0,4–3,5 mm, arista dorsal con la base café oscura a negra, de 13–18 mm de longitud. Lema pilosa en el dorso y márgenes, entre la pilosidad del dorso y la de los márgenes hay una zona glabra, los pelos alcanzan hasta 4 mm de longitud, y sobrepasan la inserción de la arista dorsal. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal (3,2–)4–4,5 mm. Lóbulos laterales de 9–13 mm, con aristas de (2,5–)4–7 mm. Pálea lanceolada, de 5,5–7,5 × 1,5–1,9 mm, finamente ciliada en los márgenes, el resto glabro, ápice obtuso a algo truncado. Lodículas 2, cuneadas, de 0,5–1 mm, glabras, muy raro pilosas, cuando pilosas, los pelos son menores de 0,5 mm. Estambres 3, anteras de 0,8–2,3 mm de largo. Ovario de 0,8–1,3 mm. Estigmas de 1–4 mm de longitud. Cariopsis elíptica, café clara, de 2,2–3 × 1–1,1 mm. Embrión de 0,9–1,5 mm de largo. Hilo de 0,8–1,4 mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,2–0,5 mm, lodículas presentes. Espiguillas cleistógamas axilares presentes, unifloras. Brácteas basales de 9,5–11 mm, membranáceas, unidas totalmente, márgenes finamente ciliados, apiculadas. Lema de 7,5–8 mm, algo coriácea, apiculada, márgenes glabros o pilosos, el dorso es glabro. Pálea de 5–5,4 mm, membranácea, apiculada, envuelve totalmente a la cariopsis. Cariopsis alargada, café oscura, de 2,4–2,5 × 0,7–0,8 mm. Embrión de 0,9–1 mm. Hilo no observado. Espiguillas cleistógamas en las vainas basales no observadas.
Distribución: endémica de Argentina.
Hábitat: crece en sierras, sobre los 1200 m de altitud.

Material estudiado:

Argentina. Prov. Córdoba: Camino a Taninga, río Chaves, 1630 m, 5.12.1958, *Nicora 6647* (BAA) – Depto. Punilla, Capilla del Monte, 1200 m, 12.1.1907, *Estrada 16810* (G, W) – Depto. Punilla, entre Copina y la Pampa de Achala, 13.1.1951, *Krapovickas 7414* (BAA). – Prov. San Luis: Sierras de San Luis, Canutal, 19.12.1929, *Castellanos s.n.* (BA, BAA).

Esta especie fue descrita como una variedad de *D. cirrata*, sin embargo, la pálea larga y angosta, la baja densidad de pelos en el dorso de la lema, las espiguillas mayores y la panícula pauciflora permiten considerarla una buena especie.

20. ***Danthonia montevidensis*** Hackel & Arechav., Anales Mus. Nac. Montevideo IV: 369. 1896. **Holotypus**: Uruguay. Montevideo, *Arechavaleta* (MVM; Iso: B!).

Icones: DERTSCHENY 1989; ROSENGURTT & ARRILLAGA 1963, lám. V; ROSENGURTT et al. 1970, pág. 48; SANTOS & CASTRO 1989, fig. 6; SMITH et al. 1982, pág. 465 (a–c).
Fig. 7: E–F

Cañas floríferas 2–5-nodes, de 9–82 cm de altura. Innovaciones extravaginales. Hojas basales de hasta 35 cm de largo, glabras, raro pilosas. Vainas glabras, raro pilosas, con mechones de pelos de hasta 3,5 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,3–0,7 mm. Láminas glabras, raro pilosas, de hasta 22 cm de largo por 1–3 mm de ancho. Panícula de 1,8–10,5 cm de largo, con 1–20(–33) espiguillas. Pedicelos pubescentes, de 0,5–15(–20) mm de longitud. Espiguillas 4–10-flo-

ras, sin considerar el antecio terminal que es estéril, la terminal de 15–27 mm. Artejos de la raquilla glabros, de hasta 0,5 mm de largo. Glumas café violáceas, linear-lanceoladas, 3, 5-nervadas, la inferior de 9–26,5 mm, la superior de 9–25 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 8–15,5 mm y desde el callo hasta el ápice de la arista dorsal de 14–26 mm, callos piloso, de 0,6–1,2 mm, pelos de 0,5–2,5 (–3) mm, arista dorsal de 10,5–21 mm de longitud. Lema pilosa en el dorso y márgenes, los pelos miden de 3–4,5 mm, los del dorso sobrepasan la inserción de la arista dorsal. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 2,5–4(–4,5) mm. Lóbulos laterales de 5–11 mm, con aristas de (2–)2,5–6 mm de largo. Pálea obovada a oblanceolada, de 3–5,5 × 1–2,1 mm, márgenes ciliados, resto glabro, ápice obtuso, truncado o bidenticulado. Lodículas 2, cuneadas, de 0,3–0,9 mm, glabras, a veces ausentes. Estambres 3, anteras de 0,8–3 mm. Ovario de 0,7–1,3 mm de largo. Estigmas de 1–1,5 mm. Cariopsis obovada, café oscura, de 1,5–2,5 × 0,6–1 mm. Embrión de 0,7–1,2 mm de largo. Hilo de 0,5–0,7 mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,2–0,6 mm, lodículas presentes, raro ausentes. Espiguillas cleistógamas axilares presentes, 1–3-floras, de 5–20 mm de longitud. Brácteas basales de 2,5–7,5 mm, algo membranáceas, unidas o separadas en la base, márgenes finamente ciliados. Artejos de la raquilla de 2–5 mm, glabros. Lema de 5–10 mm, coriácea, apiculada, glabra o pilosa tanto en los márgenes como en el dorso, lóbulos laterales de 0,5–1,3 mm, o ausentes, arista dorsal de 0,2–7,5 mm, o ausente. Pálea de 4–5,2 mm, membranácea, apiculada, márgenes finamente ciliados, el resto glabro. Anteras de 0,2–0,3 mm. Cariopsis alargada, café clara, de 2,5–3 × 0,6–0,8 mm. Embrión de 0,7–1,2 mm. Hilo de 0,5–0,8 mm. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de 3,5–7,5 mm, coriáceo, apiculado, con los márgenes ciliados, el resto glabro. Lema de 3,4–7 mm, algo coriácea, glabra, lisa, brillante, apiculada. Pálea de 2,8–6 mm, membranácea, glabra, lisa, apiculada, envuelve parcialmente a la cariopsis. Cariopsis elíptica, café clara, de 2–3,3 × 0,7–1,3 mm. Embrión de 1–1,4 mm. Hilo de 0,5–0,6(–0,8) mm.
Distribución: Brasil , Uruguay y Argentina.
Hábitat: crece en praderas secas o húmedas, campos arenosos, a orillas de esteros.

Material citado seleccionado:

Brasil. Santa Catarina: Monte Crista, Garuva, 750 m, 21.10.1966, *Klein & Ravenna 6841* (K) – Sao Joaquim, Cambajuva, 1200 m, 21.–29.1.1950, *Reitz 3436* (S).

Uruguay. Depto. Canelones: Río Santa Lucía, Paso Cuello, XII.1937, *Gallinal, Aragone, Bergalli, Campal & Rosengurtt 2248* (SI) – Toledo, 10.11.1928, *Osten 20088* (BAA). – Depto. Cerro Largo: Río Negro, Palleros, 9.12.1937, *Gallinal, Aragone, Bergalli, Campal & Rosengurtt 1642, 2008, 2050* (BAA). – Depto. Colonia: Riachuelo, 15.11.1936, *Cabrera 3907* (BAA). – Depto. Florida: Cerro Colorado, Estancia San Pedro, Parcela San Nicolás, XII.1936, *Gallinal, Aragone, Bergalli, Campal & Rosengurtt 386* (BAA) – Timote, Santa Clara, 19.11.1937, *Gallinal, Aragone, Bergalli, Campal & Rosengurtt 736* (BAA). – Depto. Maldonado: Cerro Pan de Azúcar, 19.11.1938, *Rosengurtt B-2690* (BAA). – Depto. Montevideo: Montevideo, *Arechavaleta s.n.* (B) – Punta Brava, II.1920, *Schroeder 15361* (S) – Sayago, 30–40 m, XI.1925, *Herter 123 a* (M). – Depto. Rocha: Maravillas, 5–10 m, 15.–17.11.1948, *Herter 50489 a* (BAA, MO, S). – Depto. Soriano: Juan Jackson, 18.11.1937, *Gallinal, Aragone, Bergalli, Campal & Rosengurtt 591* (BAA).

Argentina. Prov. Buenos Aires: alrededores de Buenos Aires, XII.1926, *Perez Moreau s.n.* (BA) – Cachari, 11.11.1938, *Parodi 13044* (BAA) – Conchitas, 4.11.1924, *Parodi 5869* (BAA) – El Toro, 14.11.1925, *Daguerre 181* (BA) – La Plata, El Rincón, Villa Elisa, 24.12.1935, *Burkart 7103* (SI) – Parque Pereyra, entre Buenos Aires y La Plata, 12.11.1956, *Orbea s.n.* (SI) – Pdo. Dolores, entre Dolores y Gral Guido, 23.11.1958, *Grondona 6507*

(BAA) – Pdo. La Plata, praderas cercanas al cementerio, 29.10.1928, *Cabrera 481* (LP, SP) – Pdo. Tandil, Sierra de Las Animas, La Cascada, 12.11.1962, *Boelcke, Matthei & Correa 9431, 9432* (BAA) – Pdo. Tornquist, Sierra de La Ventana, 23.11.1918, *Hauman 477* (BAA) – Punta del Indio, XII.1957, *Parodi 15426* (BAA) – Punta Piedras, 25.10.1938, *Parodi 13052* (BAA).

Esta especie puede ser confundida con *D. cirrata*, pero las innovaciones extravaginales, y la menor densidad de pelos en el dorso de la lema permiten separarlas fácilmente.

21. ***Danthonia parryi*** Scribner, Bot. Gaz. 21: 133. 1896. **Lectotypus**: Estados Unidos. Colorado, in the valley about 3 mi north of Georgetown, 19.8.1895, *Rydberg 2397* (US). ≡ *Merathrepta parryi* (Scribner) Heller, Muhlenbergia 5: 120. 1909.

Icones: A.S. HITCHCOCK 1951, fig. 420; C.L. HITCHCOCK et al. 1969, pág. 546; MUNZ & KECK 1959, fig. 2 (b).
Fig. 9: G–H

Cañas floríferas 2–4-nodes, de 24–73 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 34 cm de largo, glabras. Vainas glabras, con mechones de pelos de hasta 3 mm a ambos lados de la lígula. Lígula pestañosa, con pelos de 0,5–1,6 mm. Láminas glabras, de hasta 25 cm de largo por 2–3 mm de ancho. Panícula de 4,5–10 cm de largo, con 3–9 espiguillas. Pedicelos pubescentes, de 2–22 mm de longitud. Espiguillas 4–6-floras, sin considerar el último antecio estéril, la terminal de 19–27 mm. Artejos de la raquilla glabros, de 1–1,2 mm. Glumas café violáceas a verdosas, ovado-lanceoladas, base ancha, 5-nervadas, la inferior de 11–24 mm, la superior de 13–24 mm de longitud, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 10,5–17 mm y desde el callo hasta el ápice de la arista dorsal de 17–26 mm, callo piloso, de 0,5–1(–1,4) mm, pelos de 0,5–2,5 mm, arista dorsal de 10–18 mm de longitud. Lema pilosa en el dorso y márgenes, los pelos miden de 1–2 mm, los del dorso llegan hasta el nacimiento de la arista dorsal. La lema mide desde su base (sin incluir el callo) hasta la inserción de la arista dorsal 5,5–7,5 mm. Lóbulos laterales de 4,2–9,5 mm, con aristas de 0,5–3,5 (–4,2) mm. Pálea lanceolada, de 8,5–12,5 × 2–2,8 mm, finamente ciliada en los márgenes, resto glabro, ápice bidenticulado o algo truncado. Lodículas 2, cuneadas, de 0,5–1,2 mm, glabras, raro pilosas, cuando pilosas, los pelos miden 0,2–0,5 mm. Estambres 3, anteras de 4–7 mm de largo. Ovario de 1–2 mm. Estigmas de 1,4–3 mm. Cariopsis elíptica, café clara, de 3–4,5 × 0,9–1,4 mm. Embrión de 1,5–2 mm. Hilo de 1,5–2,5 mm de longitud. Espiguillas cleistógamas no observadas.
Distribución: Canadá y Estados Unidos.
Hábitat: crece en los márgenes de bosques, praderas húmedas, en lomajes abiertos y en riscos cercanos al límite de la vegetación arbórea.

Material citado seleccionado:

Canadá. Alberta: Stavely Range Station, 15 miles west and 12 miles north of Stavely, 4059 ft, 2.8.1959, *Ledingham 2729* (FR). – Ontario: Waterton Lakes Park, Prairie Shallow, 7.8.1939, *Moss 312* (S).

Estados Unidos. Colorado: Above Weminucke Creek, a branch of the río Grande, Hinsdale County, 13.8.1964, *Goodman 7542* (G) – Denver, Boulder County, 2885 m, 20.7.1921, *Schmoll & Clokey 4000* (C, K, S) – El Paso County, 9000 ft, 11.7.1943, *Ewan 14945* (BAA) – Georgetown, 8300 ft, 26.7.1878, *Jones 517* (FR, G) – Meadow Hawks Ranch, 25 miles south from Laramie, 2.7.1918, *Churchill s.n.* (BAA) – Rocky Mountains,

near Colorado Springs, 16.8.1913, *Paulsen s.n.* (C). – Montana: On hills above Duck Lake, 3.7 miles east of Bable Glaerer County, 28.7.1946, *Iltis s.n.* (FR). – Nebraska: Minden, Poudre Canyon, 7500 ft, 22.7.1936, *Hapeman s.n.* (S). – New Jersey: Waretown, Ocean County, 10.7.1915, *Long 12981* (BM). – New Mexico: Las Vegas, Solitario, 3110 m, 7.9.1926, *Arsène 17660* (G) – Philmont Scout Ranch, near Cimarron Road, 1 mile southeast of Baldy Town, Colfax County, 9200 ft, 8.8.1968, *Hartman 2616* (C). – Tennessee: Cumberland County, 5.6.1975, *Kral 55915* (BM). – Utah. Dillon, Summit County, 8500 ft, 26.8.1896, *Shear 1070* (K). – Wyoming: Antelope Basin, Albany County, 8.7.1900, *Nelson 7475* (K) – Green Top, 29.6.1899, *Nelson 3245* (BM) – Laramie Hills, Albany County, 19.7.1901, *Nelson 420* (K) – Pole Mountain Region, open hilltops, Albany County, 8500 ft, 17.7.1946, *Porter 4026* (S).

Esta especie se caracteriza por poseer glumas muy anchas en la base, pálea de gran tamaño, y pilosidad en el dorso de la lema algo escasa con pelos cortos.

22. ***Danthonia rhizomata*** Swallen, Comun. Bot. Mus. Hist. Nat. Montevideo 39(3): 2. 1961. **Holotypus**: Brasil. Rio Grande do Sul, Santa Victoria do Palmar, 15.11.1945, *Swallen 7364* (US; Iso: PEL).

Icones: DERTSCHENY 1989; ROSENGURTT & ARRILLAGA 1963, lám. I; ROSENGURTT et al. 1970, fig. 16; SANTOS & CASTRO 1989, fig. 7.
Fig. 9: I–J

Cañas floríferas 3–6-nodes, de 10–54 cm de altura. Rizoma muy desarrollado. Innovaciones extravaginales. Hojas basales de hasta 11 cm de largo, pilosas. Vainas pilosas, con mechones de pelos de hasta 4 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,3–1(–2) mm. Láminas pilosas, de hasta 9(–13) cm de largo por 2–3 mm de ancho. Panícula de 2,5–6,5 cm de largo, con 2–5 espiguillas. Pedicelos pilosos, de 1–12 mm de longitud. Espiguillas 4–8-floras, sin considerar el antecio terminal que es estéril, la terminal de 19–29(–31) mm. Artejos de la raquilla glabros, de 0,2–0,3 mm. Glumas violáceas a café verdosas, linear-lanceoladas, 5, 7, 9-nervadas, la inferior de 12–26(–30) mm, la superior de 11–23(–27) mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de (8,7–)12–18 mm y desde el callo hasta el ápice de la arista dorsal de (15–)17–24 mm, callo piloso, de 1–1,8(–2) mm, pelos de 0,3–3(–4) mm, arista dorsal de (9–)12–18 mm de longitud. Lema pilosa en el dorso y márgenes, los pelos del dorso son ralos, miden 2–3,5(–4) mm, se ubican en la base y no llegan a la inserción de la arista dorsal, los pelos del margen no son continuos, sino agrupados en fascículos, dos a ambos lados, uno cerca de la base y el otro un poco más arriba de la zona medial, miden igual que los pelos del dorso. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 4,5–6,5 mm. Lóbulos laterales de 6,5–10,5 mm, con aristas de (0,8–)2–5 mm. Pálea obovada, de (4,6–)5,5–7 × (1,6–)1,8–3,5(–3,8) mm, ciliada en los márgenes, el resto glabro, ápice obtuso. Lodículas 2, cuneadas, de (0,3–)0,5–1 mm, glabras. Estambres 3, anteras de 1,5–2,3 mm. Ovario de 1–1,2 mm de largo. Estigmas de 2–3 mm. Cariopsis obovado-elíptica, café clara, de (1,7–)2,2–3 × 0,9–1,4 mm. Embrión de (0,6–)0,8–1 mm de largo. Hilo de 0,5–1(–1,4) mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,2–0,6 mm, lodículas presentes. Espiguillas cleistógamas axilares presentes, unifloras. Brácteas basales de 7,5–14 mm, algo membranáceas, unidas o separadas en la base, márgenes ciliados. Lema de 5,5–8,5 mm de largo, algo coriácea, apiculada, lóbulos laterales ausentes, arista dorsal de 0,2–1,5 mm. Pálea de 4–6 mm, membranácea, apiculada, márgenes finamente ciliados. Anteras menores de 0,5 mm. Cariopsis alargada, café oscura, de 2,5–

3,5 × 0,5–1 mm. Embrión de 0,7–1,3(–1,5) mm. Hilo de 0,5–1 mm. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de 4,2–6 mm, coriáceo, apiculado, con venas prominentes, márgenes ciliados, el resto glabro. Lema de 4–5,1 mm, coriácea, glabra, lisa, brillante, apiculada. Pálea de 4–4,5 mm, membra-nácea, apiculada, glabra. Cariopsis elíptica, café oscura, de 2,4–3 × 0,9–1,3 mm. Embrión de 1–1,4 mm. Hilo de 0,5–0,9 mm.
Distribución: Brasil y Uruguay.
Hábitat: crece en campos pedregosos o arenosos, pastizales y lugares húmedos.

Material estudiado:

Brasil. Rio Grande Do Sul: Mun. Peresópolis, Porto Alegre, XI.1948, *Araujo 552* (BAA).
Uruguay. Depto. Lavalleja: Estancia Pororó, 14.12.1948, *Rosengurtt B-5320* (B, BAA, LP). – Depto. Maldonado: Abra de Perdomo, 21.9.1948, *Rosengurtt B-5267* (B, BAA, BR, K, SI) – Sierra de Las Animas, Arroyo de Las Flores, 16.11.1971, *Rosengurtt B-11275* (BAA, K, W). – Depto. Montevideo: Sayago, 30–40 m, XI.1925, *Herter 133* (B, G, M, MO, S). – Depto. Rocha: Maravillas, 5–10 m, 15.–17.11.1948, *Herter 50489 b* (MO, S).

Se caracteriza por sus innovaciones extravaginales, rizoma muy desarrollado, glumas de gran tamaño, callo alargado y por la panícula pauciflora.

23. ***Danthonia secundiflora*** J.Presl subsp. ***secundiflora***, Rel. Haenk. 1: 255. 1830. **Holotypus**: In montanis Peruviae? (PR; Fototypus: CONC!).
= *Danthonia montana* Doell, Fl. Bras. 2(3): 101. 1878. Holotypus: Brasil. Rio de Janeiro, Serra dos Orgãos, 11.12.1869, *Glaziou 4312* (Iso: B!, C!, K!, W!).
= *Danthonia tenuifolia* Doell, Fl. Bras. 2(3): 102. 1878. Holotypus: Brasil. In itinere ad prov. Minarum Generalium legit cl. *Langsdorff* (LE).
= *Danthonia dusenii* Ekman, Ark. Bot. 10(17): 24. 1911. Holotypus: Brasil. Paraná, Curityba, Pinhaes, in paludosis, 13.11.1909, *Dusen 8929* (S!; Iso: B!, BM!, W!).
= *Danthonia filifolia* C.E.Hubbard, Contr. Gray Herb. 52: 60. 1917. Holotypus: Mexico. Puebla, Honey, 17.6.1908, *Pringle 10818* (GH).
= *Danthonia quinquenervata* Roseng. & Arrill., Bol. Fac. Agron. Univ. Montevideo 71: 27. 1963. Holotypus: Uruguay. Depto. Canelones, Arroyo Sarandí sobre el río de La Plata, cerca de Costa Azul, 26.2.1956, *Rosengurtt B-6510* (MVFA).

Icones: DERTSCHENY 1989; ROSENGURTT & ARRILLAGA 1963, láms. VIII–X; SANTOS & CASTRO 1989, figs. 5 y 8; ROSENGURTT et al. 1970, figs. 14 y 17.
Fig. 4: C–D

Cañas floríferas 1–4-nodes, de 9,5–70 cm de altura. Innovaciones intra o extravaginales. Hojas basales de hasta 40 cm de largo, glabras, muy raro pilosas ralas. Vainas glabras, con mechones de pelos de hasta 5 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,2–0,8 mm, que se continuan un poco hacia arriba en la lámina. Láminas glabras, a veces con pelos cortos en la cara adaxial, de hasta 30 cm de largo por 1–2,5 mm de ancho. Panícula de 3,5–15 cm de largo, con 4–60(–80) espiguillas. Pedicelos pubescentes, de 0,5–12(–14) mm de longitud. Espiguillas 3–9-floras, sin considerar el antecio terminal estéril, la terminal de 12–28(–30) mm. Artejos de la raquilla glabros, de 0,3–0,7 mm. Glumas violáceas a café verdosas, lineares, la inferior de 7,5–25,5 mm, 3, 5–9-nervada, la superior de 6,5–23 mm, 3, 5, 7-nervada, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 7–15,5(–17,5) mm y desde el callo hasta el ápice de la arista dorsal de 11,8–26(–27,5) mm, callo piloso, de 0,5–1 mm, pelos de (0,5–)1–6(–7) mm,

sobrepasan la inserción de la arista dorsal y el ápice de la pálea, arista dorsal de 8,5–20 mm de longitud. Lema pilosa en los márgenes, los pelos miden 2–4 mm, el dorso es glabro. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 2,5–5(–5,5) mm. Lóbulos laterales de 4–10,5(–11,5) mm, con aristas de (1,8–)2–7 mm. Pálea oblanceolada, de (2,5–)3–6,5(–7,5) × 0,7–2,1 mm, finamente ciliada en los márgenes, el resto glabro, ápice obtuso, agudo o truncado. Lodículas 2, cuneadas, de 0,6–0,9 mm, glabras, raro pilosas, cuando pilosas, los pelos miden 0,1–0,3 mm, a veces ausentes. Estambres 3, anteras de 0,9–3,5 mm. Ovario de 0,6–1(–1,5) mm. Estigmas de 1–3 mm de largo. Cariopsis elíptica, café clara, de 1,5–2,2 × 0,6–1 mm. Embrión de 0,6–1 mm. Hilo de 0,3–0,7 mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,2–0,4 mm, lodículas ausentes, raro presentes. Espiguillas cleistógamas axilares presentes, 1–2-floras, de 5–12 mm de longitud. Brácteas basales de 4–6,5 mm, membranáceas, unidas o separadas en la base, con los márgenes ciliados. Artejos de la raquilla de 2–2,2 mm, glabros. Lema de 4,5–9 mm, membranácea, apiculada, con pelos en la base del dorso y márgenes, lóbulos laterales ausentes, arista dorsal de 0.8–2 mm. Pálea de 3,5–5 mm, membranácea, apiculada, márgenes finamente ciliados. Anteras de 0,2–0,4 mm. Cariopsis alargada, café clara, de 2–2,5 × 0,7–0,8 mm. Embrión de 0,8–0,9 mm. Hilo de 0,5–0,7 mm. Espiguillas cleistógamas en las vainas basales presentes, 1–2-floras. Profilo externo de 4–8 mm, coriáceo, liso, o con venas notables, márgenes finamente ciliados, el resto glabro. Lema de (3,5–)4–6,5 mm, coriácea, glabra, lisa, apiculada. Pálea de (3–)3,5–6 mm, algo coriácea, márgenes ciliados, el resto glabro, apiculada. Cariopsis elíptica, café oscura, de 1,5–3 × 0,7–1,4 mm. Embrión de 0,6–1,5 mm. Hilo de 0,3–0,6 mm.
Distribución: México, Guatemala, Colombia, Venezuela, Ecuador, Perú, Brasil, Bolivia, Uruguay y Argentina.
Hábitat: especie helófita muy adaptada a diferentes hábitats, debido a su enorme distribución. Crece en praderas naturales, en dunas litorales, turberas, pantanos, pajonales, campos húmedos, suelos pedregosos, páramos.

Material citado seleccionado:

México. Chiapas: Municipio of Tenejapa, 9000 ft, 12.5.1966, *Shilom Ton 950* (IPN) – Municipio of Chamula, 2590 m, 14.11.1981, *Breedlove & Bartholomew 55502* (MO). – Hidalgo: Distrito Zacualtipán, roadsides in pine-oak, woods between Zacualtipán and Tepeoco, 18.10.1949, *Moore Jr. 5787* (BM, G).

Guatemala. Department of El Quiché, Valley of Rio de Las Violetas, N of Nebaj, 5800–6000 ft, 25.6.–17.8.1964, *Proctor 25034* (S).

Venezuela. Estado Lara: Distrito Moran, carretera de Arenales a Jabon, 22.–25.1.1985, *Escalona & Escalona 205* (MO) – Distrito Moran, Mun. Jabon, 2150 m, 18.1.1988, *Escalona & Escalona 244* (MO). – Estado Mérida: Distrito Sucre, entre la Encrucijada y El Molino, carretera Estanquez-Canaguá, 2700 m, 1.5.1976, *Badillo 7187* (MY) – Páramo La Negra, 3050 m, 23.10.1963, *Ramia 2851* (MY) – Páramo Mucubaji, Parque Nacional Sierra Nevada, sur de la entrada al Parque, 3550 m, 29.9.980, *Briceño & Adamo 224* (MO) – Sierra Nevada, alrededores de la Laguna Coromoto, ca. 3360 m, 3.12.1959, *Barclay & Juajibioy 10001* (MO). – Estado Zulia: Distrito Maracaibo, Sierra de Perijá, Serranía de Valledupar, Campamento "Monte Viruela", 3100 m, 21.–28.7.1974, *Tillett 747-1183* (MO, MY) – Distrito Perijá, Sierra de Perijá, Serranía de Valledupar, alrededores del Campamento "Frontera V", 2700–3300 m, 10.–19.7.1974, *Tillett 747-1003, 747-1067* (MO, MY).

Colombia. Depto. Antioquía: Mun. de Urrao, Páramo de Frontino, Llano Grande, 3380 m, 5.1.1985, *Londoño, Garcia & Sanchez 646* (COL). – Depto. Boyacá: By the río Chula, NE of Tunja, 2600 m, 28.5.1983, *Wood 3759* (K) – Cordillera Oriental, Páramos de Güina-Santa Rosita, 3250–3300 m, 17.7.1940, *Cuatrecasas & Garcia 8/9798* (COL) – Páramo de La Rusia, ca. 15 km NW of Duitama, towards Charala, 3300 m, 1.12.1984, *Wood 4629* (K) – Santuario

de Iguaque, 12 km N of Villa de Leyva, ca. 3300 m, 13.10.1980, *Melampy 1138* (MO). – Depto. Cauca: Cordillera Central, filo de la cordillera, al N del volcán Puracé, alrededores de la Laguna de San Rafael, páramo, 3350 m, 29.1.1947, *Cuatrecasas 23450* (S) – Macizo Colombiano, Páramo de Las Papas, El Boquerón y alrededores de la Laguna La Magdalena, 3500 m, 16.10.1958, *Idrobo & Barclay 4064* (COL). – Depto. Cundinamarca: La Calera, 2900 m, 15.5.1983, *Wood 3728* (K) – Near Usaquén, 2800–2900 m, 12.3.1939, *Killip 34046* (COL) – Páramo de Chisacá, 3750–3962 m, 8.9.1966, *Soderstrom 1330* (B, K, MO) – Páramo de Palacio, km 19 de la carretera, cabecera río Negro, 3375 m, 22.5.1972, *Cleef 3944* (COL) – Páramo El Tablazo, W of Subachoque, 3100 m, 1983, *Wood 3619* (COL, K). – Depto. Magdalena: Mun. Robles, Sierra de Perijá, east of Manaure, Sabana Rubia, 3000–3100 m, 6.–8.11.1959, *Cuatrecasas & Romero 25066* (COL) – Mun. Valledupar, Corregimiento de San Sebastián, Diurimeina, 3000 m, III.1944, *Reyes 8* (COL). – Depto. Nariño: Cumbál, 4000 m, 19.3.1941, *Sneidern 369* (S). – Depto. Santander: Norte de Santander, Páramo de Las Jurisdicciones, SW of Ocaña, 3300 m, 8.7.1984, *Wood 4525* (K).

Ecuador. Prov. Azuay: 5.6 km of La Paz on the Pan American Highway, and 36.3 km N of Ona, 3000 m, 24.4.1990, *Peterson, Annable & Poston 8885* (MO). – Prov. Loja: 10 km S of Saraguro, 3500 m, 31.8.1985, *Laegaard 55220* (MO). – Prov. Napo: Páramo de Mirador, above Cocha Seca, 3700–3900 m, 23.5.1985, *Laegaard 54414* (MO). – Prov. Carchi: Páramo del Angel, 3400 m, 22.1.1940, *Asplund 10396* (K). – Prov. Sucumbios: Páramo Mirador, SW of Playón de San Francisco, S of río Chingual headwaters, 3400–3600 m, 15.5.1990, *Peterson, Judziewicz & King 9157* (K, MO).

Brasil. Espírito Santo: Serra do Caparaó, 2100–2200 m, 30.4.–4.5.1925, *A. Chase 9660, 9683* (MO). – Minas Gerais: Estrada de Soupa até São João da Chapada, 1.4.1980, *Burman 558* (SP) – Mun. Ouro Prêto, northeastern outskirts of city of Ouro Prêto, about 2.5 km ENE of center of city, 1250 m, 28.11.1965, *Eiten 6942* (K, SP) – Parque Nacional do Caparaó, Vale Verde, 19.11.1988, *Krieger 23976* (MO). – Paraná: Curityba, Anta estrada Curityba, San José dos Pinhais, 26.11.1970, *Imaguirre 623* (K) – Curityba, Mananciais da Serra Piraquara, 14.11.1975, *Dombrowski 6139* (M) – Curityba, Pinhaes, in paludosis, 13.11.1909, *Dusen 8929* (B, BM, W, S) – Ipiranga, ad marg. viae ferreae, 8.11.1911, *Dusen 13332* (S) – Jaguariahyva, ad ripan fluminis, ca. 700 m, 19.5.1914, *Jönsson 389 a* (BR, C, G, S, SI) – Mun. Agua Doce, 16 km south of Horizonte, 2.12.1971, *Smith & Klein 15587* (M, MO) – Mun. Arapoti, Rio das Cinzas, 12.10.1968, *Hatschbach 20022* (C, K) – Mun. Balsa-Nova, Br. do Café, km 37, 25.11.1981, *Klein, Sohn & Leite 12052* (K) – Mun. Colombo, Rio Palmital, 1.9.1973, *Hatschbach 32992* (C, K, MO) – Mun. Marmeleiro, Estr. Marmeleiro-Campo Eré, 25.10.1969, *Hatschbach 22670* (K) – Mun. Palmas, 5.12.1971, *Hatschbach 28242* (K) – Mun. Palmeira, Fazenda Padre Inacio, 31.10.1968, *Hatschbach 20155* (C, K, MO) – Mun. Piraquara, Estrada Rio Taquari-Rio Divisa, 13.11.1949, *Hatschbach 1619* (BAA) – Mun. Quatro Barras, Rio Taguari, 24.1.1965, *Clayton 4308* (K). – Rio de Janeiro: Alto de Itatiaia, 2400–2500 m, 17.1.1925, *A. Chase 8289* (BAA, MO) – Petrópolis, río Hamaraky, 27.8.1888, *Glaziou 17899* (BM, K) – Serra dos Orgãos, 2000 m, 13.7.1956, *Cabrera 12298* (BAA) – Serra dos Orgãos, 11.12.1869, *Glaziou 4312* (B, C, K, W) – Serra dos Orgãos, Campo dos Antas, 200 m, 13.7.1956, *Cabrera 12301* (LP). – Rio Grande Do Sul: Bom Jesus, 15.1.1942, *Rambo 8746* (BAA) – Mun. Guaiaba, Bairro Passopetim, 25.–26.3.1985, *Mizoguchi 2359* (MO) – Mun. Rio Pardo, 70 m, X.1909, *Jürgens G 84* (W) – Mun. São Francisco de Paula, Fazenda Guirra, about 12 km from S. Francisco, on old road to Canela, 7.12.1979, *Pedersen 12641* (C) – São Leopoldo, 27.11.1935, *Orth 2707* (MO) – San Borja, VI.1907, *Araujo 302* (BAA) – Serra da Rocinha, prope Bom Jesus, 3.2.1953, *Rambo 53776* (B). – Santa Catarina: Campo dos Padres, Bom Retiro, 1950 m, 17.12.1948, *Reitz 3495* (G) – Mun. Bom Jardim da Serra, 17.12.1971, *Smith & Klein 15860* (B, K) – Mun. Campo Alegre, 900–1000 m, 6.11.1956, *Smith & Klein 7310* (K) – Mun. Campo Erê, 8 km west of Campo Erê, 900–1000 m, 7.12.1964, *Smith & Klein 13787* (K, SI) – Mun. Curitibanos, Marombinhas, 28.11.1971, *Smith & Klein* 15480 (K) – Mun. Irani, Campo de Irani, 700–900 m, 8.11.1964, *Smith & Klein 13027* (B, K, MO, S) – San Joaquim, Morro de Igreja,

22.1.1960, *Mattos 7308* (SP). – São Paulo: Butantan, Capital São Paulo, 31.10.1947, *Brandão Joly 512* (SP) – Campos do Bocaina, 8.1.1876, *Glaziou 7977* (K) – Campos do Jordão, 20.6.1940, *Hashimoto 332* (SP) – Estaçao de Campo Grande, Estação Biológica, 14.7.1961, *Mattos 9058* (SP) – Mun. São Paulo, 10 km ao sul do centro da cidade de São Paulo, nos campos do Instituto de Botânica, Parque do Estado. 16.10.1967, *Sendulsky 745, 747* (MO, SP) – Subdistrito de Sto. Amaro, 15 km W of center of city of São Paulo, 30.4.1963, *Sendulsky 106* (SP).

Bolivia. Puno: Escoma, La Loma, 4000 m, 6.3.1928, *Troll 1619* (B).

Uruguay. Depto. Canelones: Arroyo Sarandí y Ruta Interbalnearia, 3.1.1961, *Arrillaga 959 a* (BAA) – Bañado del Negro, cerca del Arroyo Pando, 30.3.1972, *Rosengurtt 11330* (BAA, MO) – Fortín Santa Rosa, 20.12.1959, *Rosengurtt B-7757 b* (BAA) – Parque Centenario, XII.1936, *Rosa-Mato 1467* (BAA) – Parque Plata, 7.12.1947, *Herter 99851* (B). – Depto. Montevideo: Carrasco, 18.12.1937, *Legrand 1229* (BAA). – Depto. San José: Delta El Tigre, 29.11.1961, *Del Puerto 806* (LP) – Barra Santa Lucía, 29.11.1929, *Osten 21771* (G, GOET).

Argentina. Prov. Salta: Pampa Grande, I.1897, *Spegazzini s.n.* (LP).

Es la especie que presenta la mayor distribución en América. Esta situación ha significado de que muchos autores hayan descrito nuevas especies, basados fundamentalmente en caracteres biométricos y no morfológicos. La distribución de esta especie desde México hasta Argentina le permite ocupar una enorme diversidad de hábitats, lo que se traduce en una gran variabilidad en cuanto a los caracteres morfométricos. Las plantas que crecen en México presentan un menor tamaño que las plantas que crecen en Uruguay, pero entre estos polos existen enormes variaciones, sobre todo en Brasil, donde la especie está ricamente distribuida y donde presenta las mayores variaciones, inclusive dentro de las mismas poblaciones. Se trata de un complejo, que probablemente necesite de otra metodología o técnicas para así poder dilucidar la problemática que encierra.

24. ***Danthonia secundiflora*** J.Presl subsp. ***charruana*** (Swallen) Roseng., Arrill. & Izag., Gramín. uruguayas 55. 1970 ≡ *Danthonia charruana* Swallen, Comun. Bot. Mus. Hist. Nat. Montevideo 39(3): 1. 1961. **Holotypus**: Brasil. Rio Grande do Sul, Estancia Charrua, south of Santa Victoria do Palmar, 17.11.1945, *Swallen 7414* (US; Iso: PEL). ≡ *Danthonia dusenii* Ekman var. *charruana* (Swallen) Roseng. & Arrill., Bol. Fac. Agron. Univ. Montevideo 71: 26. 1963.

Icones: ROSENGURTT et al. 1970, fig. 17; SANTOS & CASTRO 1989, fig. 9.
Fig. 4: A–B

Cañas floríferas 2–7-nodes, de 12–57 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 30 cm de largo, glabras o pilosas ralas. Vainas glaras, con mechones de pelos de hasta 2,5 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,3–0,5 mm. Láminas glabras, a veces con pelos ralos y cortos en la superficie adaxial, de hasta 14 cm de largo por 1,2–2 mm de ancho. Panícula de 2,4–8 cm de largo, con 2–10 espiguillas. Pedicelos glabros o pubescentes, de 1–12 mm de longitud. Espiguillas 4–7-floras, sin considerar el antecio terminal que es estéril, la terminal de (13–)18–24 mm. Artejos de la raquilla glabros, de 0,2–1 mm. Glumas café violáceas a verdosas, lineares, la inferior de 9–19,5 mm, 5, 6, 9-nervada, la superior de 9–19 mm, 6, 8, 9-nervada, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 7,5–9,3 mm y desde el callo hasta el ápice de la arista dorsal de 18–19,5 mm, callo piloso, de 0,6–0,8 mm, pelos de 0,2–2(–2,2) mm, no alcanzan a llegar hasta la inserción de la arista dorsal, arista dorsal de (9–)13,5–15 mm de

longitud. Lema pilosa en los márgenes, los pelos miden 2,5–3 mm, el dorso es glabro. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 3–4,3 mm. Lóbulos laterales de 2,5–5,5 mm, con aristas de 0,5–2 mm o mucronados. Pálea oblanceolada, de 3,6–4,5 × 1–1,3 mm, finamente ciliada en los márgenes, el resto glabro, ápice obtuso a algo truncado. Lodículas 2, cuneadas, de 0,4–0,6 mm, glabras, a veces ausentes. Estambres 3, anteras cleistógamas de 0,3–0,7 mm. Ovario de 0,7–0,8 mm. Estigmas de 1–1,5 mm de largo. Cariopsis elíptica, café clara, de 1,5–2 × 0,6–0,9 mm. Embrión de 0,7–0,9 mm. Hilo de 0,4–0,7 mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,3–0,7 mm, lodículas presentes o ausentes. Espiguillas cleistógamas axilares presentes, 1–2-floras, de 4–11 mm de longitud. Brácteas basales de 4–8,5 mm, coriáceas, unidas o separadas en la base, márgenes ciliados. Artejos de la raquilla de 3,5 mm, glabros. Lema de 3,8–8,5 mm, algo membranácea, apiculada, lóbulos laterales ausentes, arista dorsal de 0,6–2 mm. Pálea de 3,5–7 mm, membranácea a algo coriácea, apiculada, brillante, con los márgenes finamente ciliados. Anteras de 0,5–0,6 mm. Cariopsis alargada, café clara, de 2,3–3 × 0,5–0,9 mm. Embrión de 0,8–1,4 mm. Hilo de 0,5–1 mm. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de 3,5–6,2 mm, coriáceo, apiculado, con venas notorias, márgenes finamente ciliados, el resto glabro. Lema de 3,2–6 mm, coriácea, glabra, brillante, apiculada. Pálea de 2,5–5,5 mm, algo membranácea, glabra, brillante, apiculada. Cariopsis elíptica, café clara, de 2–2,8 × 0,8–1,6 mm. Embrión de 0,7–1,4 mm. Hilo de 0,4–1 mm.
Distribución: Brasil y Uruguay.
Hábitat: crece en praderas húmedas.

Material estudiado:

Brasil. Rio de Janeiro: Itatiaia, caminho entre Abrigo Rebouças e Prateleiras, 13.3.1960, *Castellanos 22670* (COL).
Uruguay. Depto. Rivera: Mazangano, río Negro, 28.12.1961, *Rosengurtt B-8266* (BAA).

Es una subespecie muy bien definida dentro del complejo *D. secundiflora*. Los lóbulos de la lema muchas veces múticos o con aristas cortas y los pelos del callo cortos permiten diferenciarla fácilmente de las otras subespecies.

25. ***Danthonia secundiflora*** J.Presl subsp. ***mattheii*** C.M.Baeza, **subsp. nov**.
Holotypus: Brasil. Paraná: Mun. Guaratuba, Serra do Araçatuba, das encostas do morro, 1300 m, 9.11.1983, *Kummrow 2423* (G!; Iso: C!, CONC!, S!).

Fig. 5: A–H

Subspecies differt haec ab *Danthonia secundiflora* subsp. *charruana* aristis lobuli longioris lemnarum, nunquam mucronati, et pilis calli longioribus; ab subsp. *secundiflora* differt dorso lemnarum piloso, haud glabro.

Cañas floríferas (1–)2–4-nodes, de 13–73 cm de altura. Innovaciones extravaginales. Hojas basales de hasta 17 cm de largo, pilosas a pilosas ralas. Vainas glabras, raro pilosas, con mechones de pelos de hasta 3,5 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,3–0,6(–1,5) mm. Láminas pilosas a pilosas ralas, de hasta 16 cm de largo por 1–2 mm de ancho. Panícula de 3,5–8 cm de largo, con 4–26 espiguillas. Pedicelos pubescentes, de 1–12 mm de longitud. Espiguillas 4–6-floras, sin considerar el último antecio que es estéril, la terminal de 18–23 mm. Artejos de la raquilla glabros, menores de 0,5 mm. Glumas violáceas a café verdosas, lineares a algo

lanceoladas, 5-nervadas, la inferior de 12,5–20 mm, la superior de 12–18 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 9–12,5 mm y desde el callo hasta el ápice de la arista dorsal de 14–20,5 mm, callo piloso, de 0,8–1,4 mm, pelos de 0,5–5 mm, arista dorsal de (9–)12–16 mm de longitud. Lema pilosa en el dorso y márgenes, los pelos del dorso son ralos y crecen hasta la zona media, no alcanzan el ápice de la pálea, miden de 1,7–3 mm, los pelos del margen miden 3–4 mm de longitud. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 3,5–4,5 mm. Lóbulos laterales de (3,5–)5–7,5 mm, con aristas de (1,8–)3–5 mm. Pálea oblanceolada, de 3,5–6 × 1–1,5 mm, ciliada en sus márgenes, el resto glabro, ápice obtuso o agudo. Lodículas 2, cuneadas, de 0,6–0,8 mm, glabras, a veces ausentes. Estambres 3, anteras de 1–2 mm. Ovario de 0,8–1,2 mm. Estigmas de 2–2,5 mm de largo. Cariopsis elíptica, café oscura, de 1,7–2,3 × 0,8–1 mm. Embrión de 0,8–1,2 mm. Hilo de 0,3–0,5 mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,3–0,4 mm, lodículas presentes o ausentes. Espiguillas cleistógamas axilares no observadas. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de (3,3–)4–5,7 mm, coriáceo a algo membranáceo, apiculado, con los márgenes finamente ciliados, el resto glabro. Lema de (2,5–)4,5–5,5 mm, algo coriácea, glabra, apiculada. Pálea de (2–)4–4,5 mm, membranácea, márgenes ciliados, el resto glabro. Cariopsis elíptica, café clara, de 2,5–2,6 × 0,9–1 mm. Embrión de 0,8–1 mm. Hilo de 0,3–0,4 mm.
Distribución: Brasil y Bolivia.
Hábitat: crece en praderas de altura (sobre 1500 m), y en el piso de bosques talados.

Material estudiado:

Brasil. Paraná: Mun. Guaratuba, Serra do Araçatuba, das encostas do morro, 1300 m, 9.11.1983, *Kummrow 2423* (C, CONC, G, S). – Rio de Janeiro: Serra do Itatiaia, 2300–2400 m, 26.4.1949, *Kuhlman s.n. a* (SP). – Sao Pãulo: Campos do Jordão, Pico do Itapeva, 27.11.1949, *Kuhlman 2218, 2229* (SP) – Campos do Jordão, Pico de Itapeva, ca. 2000 m, 13.11.1949, *Jolyn 894* (BAA) – Serra Mantiqueira, Campos do Jordão, 1570 m, 20.–22.5.1925, *A. Chase 9848 b* (MO).

Bolivia. Santa Cruz: Caballero, lumber camp above Tunal, 30 km NE of El Tambo School, 2800 m, 10.6.1987, *Killeen 2522* (MO).

Esta nueva subspecie se diferencia de la subsp. *charruana* por poseer lóbulos con aristas largas, nunca mucronados y por los pelos largos del callo. De la subsp. *secundiflora* por los pelos ubicados en el dorso de la lema, carácter nunca antes detectado en este complejo.

26. ***Danthonia sericea*** Nutt., Gen. N. Amer. Pl. 1: 71. 1818. **Lectotypus**: Estados Unidos. From Carolina to Florida, *Nuttall* (PH). ≡ *Merathrepta sericea* (Nutt.) Heller, Muhlenbergia 5: 120. 1909. ≡ *Pentameris sericea* (Nutt.) Nels. & Macbr., Bot. Gaz. 56(5): 470. 1913.
= *Danthonia glabra* Nash., Bull. Torrey Bot. Club 24(1): 43. 1897. Typus: Estados Unidos. Georgia, Little Stone Mountains, DeKalb County, 5.7.1895, *Small s.n.*, *non* Phil., Anales Univ. Chile 94: 30. 1896.

Icones: BRITTON & BROWN 1896, fig. 399; GLEASON 1952, pág. 158; A.S. HITCHCOCK 1951, fig. 418.
Fig. 9: E–F

Cañas floríferas 2–4-nodes, de 23–88 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 38 cm de largo, muy pilosas. Vainas pilosas, raro glabras, con mechones de pelos de hasta 3 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,5–2 mm. Láminas pilosas, de hasta 30 cm de largo por 2–4 mm de ancho. Panícula de 5,5–14 cm de largo, con 6–29 espiguillas. Pedicelos pubescentes, de 1–14 mm de longitud. Espiguillas 5–9-floras, sin considerar el antecio terminal que es estéril, la terminal de 17–23 mm. Artejos de la raquilla glabros, de hasta 1 mm. Glumas verdosas a café claras, linear-lanceoladas, 5–7-nervadas, la inferior de 12–19 mm, la superior de 12–18 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 8–10 mm y desde el callo hasta el ápice de la arista dorsal de 14,5–19,5 mm, callo piloso, de 0,5–0,8 mm, pelos de 0,5–1,2 mm, arista dorsal de 10–14 mm de longitud. Lema pilosa en el dorso y márgenes, pelos de hasta 3 mm, los del dorso sobrepasan la inserción de la arista dorsal. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 3,5–4,5 mm. Lóbulos laterales de (1–)2–5 mm, con aristas de 1–2,8 mm. Pálea obovada, de 4–6 × 1,2–1,5 mm, finamente ciliada en los márgenes, resto glabro, ápice bidenticulado, obtuso a algo agudo. Lodículas 2, cuneadas, de 0,5–1 mm, glabras. Estambres 3, anteras de 2–2,5 mm. Ovario de 0,7–1,2 mm de largo. Estigmas de 0,8–1,4 mm. Cariopsis elíptica, café oscura, de 2–2,2 × 0,7–1 mm. Embrión de 0,5–0,8 mm. Hilo de 0,7–1 mm.
Cleistogamia: espiguillas cleistógamas aéreas no observadas. Espiguillas cleistógamas axilares presentes, unifloras. Brácteas basales de 2,2–2,5 mm, membranáceas, con los márgenes finamente ciliados. Lema de 7–7,5 mm, membranácea, con pelos cortos en el dorso, el resto glabro, lóbulos laterales de 0,5–0,7 mm, arista dorsal de 1,5–1,7 mm. Pálea de 3,6–3,8 mm, membranácea, márgenes ciliados. Anteras de 0,3–0,4 mm. Cariopsis alargada, café clara, de 2,6–2,7 × 0,8–0,9 mm. Embrión de 0,8–1 mm. Hilo de 0,9–1 mm. Espiguillas cleistógamas en las vainas basales no observadas.
Distribución: Canadá y Estados Unidos.
Hábitat: especie muy variable en cuanto a su hábitat. Crece en suelos arenosos secos, márgenes de bosques, turberas, bordes de arroyos.

Material citado seleccionado:

Estados Unidos. Alabama: Gulf States, 1.5.1903, *Tracy 8368* (G) – 3 miles NW Wadley on Ala 77, Randolph County, 19.5.1968, *Kral 30792* (C). – 20 miles N of Mobile, Mobile County, 5.4.1963, *Iltis, Kawano & Crosswhite 21361* (BM). – Colorado: Rocky Mountains, Morley, 20.6.1885, *Macoun 2818* (BM). – Florida: Chattahoochee, IV.1883, *Curtiss 3542* (K, M). – Georgia: De Halle County, 20.5.1897, *Eggert s.n.* (BM) – Oglethorpe County, 22.5.1965, *Montgomery & Duncan 22489* (BM, G) – 18 miles S of Dublin, Laurens County, 4.5.1969, *Duncan 23320* (G). – Missouri: Biloxi, 15.4.1898, *Tracy 4531* (G) – Ocean Springs, 4.5.1890, *Tracy s.n.* (C). – New Jersey: Egg Harbor. Atlantic City, 14.6.1916, *A. Chase s.n.* (B, BM, C, G, K, S, SP). – New York: Spring Garden, 4.7.1868, *Diffenbaugh s.n.* (G). – North Carolina: Biltmore, 9.6.1897, *Vocke 343 b* (GOET) – Near Eno River, NE of Braggtown, Durham County, 13.6.1966, *Radford 44755* (S) – 1.3 miles east of Bertiechowan County, line (Chowan River) on US 17 (west of Edenton), Chowan County, 9.5.1958, *Ahles & Ashworth 39669* (S) – Rowan County, in meadows near Faith, 27.5.1911, *Heller 10281* (G). – South Carolina: McCormick County, ca. 320 ft, 4.5.1949, *Duncan 9439* (BM). – Ohio: Columbus, V.1875, *Curtiss s.n.* (G). – Tennessee: Knox County, V.1895, *Ruth 11890* (M) – Ca. 2.5 miles N of Monteagle toward Tracy City, Grundy County, 17.5.1972, *Kral 46522* (BM). – Virginia: Fortress Monroe, 30.5.1878, *Chickering Jr. s.n.* (BM) – Norfolk County, 15.5.1872, *Curtiss s.n.* (G, S) – Virginia Beach, 27.6.1905, *Hitchcock s.n.* (B, BM, C, G, S).

Debido a su capacidad de vivir en diversos hábitats, esta especie presenta variaciones en cuanto a su pilosidad, tamaño de la panícula, número de espiguillas y peso de la cariopsis. QUINN et al. (1972) realizan un interesante trabajo, en el cual dejan claramente establecido que esta especie es altamente sensible al tipo de suelo que habita. De acuerdo a esta consideración concluyen que las plantas de suelos bien drenados presentan características diferentes a las que viven en suelos secos, pero se trata únicamente de adaptaciones al medio ambiente.

27. ***Danthonia spicata*** (L.) P.Beauv. ex Roemer & Schultes, Syst. Veg. 2: 690. 1817 ≡ *Avena spicata* L., Sp. Pl. 80. 1753. **Neotypus**: Estados Unidos. Pennsylvania. (LINN). ≡ *Pentameris spicata* (L.) Nels. & Macbr., Bot. Gaz. 56: 470. 1913.
= *Danthonia spicata pinetorum* Piper, Erythea 7: 103. 1899. Holotypus: Washington. Mason County, 22.7.1890, *Piper 943* (WS). ≡ *Merathrepta pinetorum* Piper, Contr. U.S. Natl. Herb. 11: 122. 1906.
= *Danthonia thermale* Scribner, U.S.D.A. Div. Agrostol. Rep. Agrostol. 30: 5. 1901. Typus: Wyoming. Norris basin, Yellowstone Park, *Nelson & Nelson 6140.* ≡ *Pentameris thermale* (Scribner) Nels. & Macbr., Bot. Gaz. 56: 470. 1913.

Icones: ABRAMS 1955, fig. 391; DARBYSHIRE & CAYOUETTE 1989, fig. 2 (a–c, j–l); GLEASON 1952, pág. 158; GOULD 1975, fig. 21; C.L. HITCHCOCK et al. 1969, pág. 546; MUNZ & KECK 1959, fig. 2 (a).
Fig. 8: A–C

Cañas floríferas (1–)2–5-nodes, de 9–70 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 20 cm de largo, normalmente menores, pilosas, a veces glabras. Vainas glabras o pilosas, con mechones de pelos de hasta 4 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,2–0,7 mm. Láminas glabras o pilosas, cuando pilosas, los pelos se ubican en su mayoría en los márgenes, a veces pilosas en ambas superficies, de hasta 16 cm de largo por 1–3 mm de ancho. Panícula cerrada, de 2–6,5 cm de largo, con 2–13 espiguillas. Pedicelos pubescentes, de 0,5–8(–11) mm de longitud. Espiguillas 4–8-floras, sin considerar el antecio terminal que es estéril, la terminal de 10–15 mm. Artejos de la raquilla glabros, de 0,3–1 mm. Glumas verdosas a violáceas, linear-lanceoladas, la inferior de 7–13 mm, 5–7-nervada, la superior de 6,5–13 mm, 5, 7, 9-nervada, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 3,5–6 mm y desde el callo hasta el ápice de la arista dorsal de 9–12 mm, callo piloso, de 0,2–0,3 mm, pelos de 0,2–0,7(–1,3) mm, arista dorsal de 6–8,5 mm de longitud. Lema pilosa en el dorso y márgenes, raro glabra, los pelos miden hasta 0,7 mm de longitud y alcanzan a llegar hasta la inserción de la arista dorsal. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 2,5–3,5 mm. Lóbulos laterales de (0,5–)0,8–2(–2,6) mm, con aristas de 0,3–1(–1,5) mm, o terminando en un pequeño mucrón. Pálea ovada, de 2,8–4 × 0,9–1,5 mm, finamente ciliada en los márgenes, el resto glabro, ápice obtuso, agudo o algo truncado. Lodículas 2, cuneadas, de 0,3–0,6 mm, glabras, muchas veces ausentes. Estambres 3, anteras de 1,4–2 mm. Ovario de 0,5–0,8 mm de largo. Estigmas de 1–1,5 mm. Cariopsis ovoide a elíptica, café oscura, de 1,5–2,3 × 0,7–1 mm. Embrión de 0,5–1 mm. Hilo de 0,3–0,5 mm.
Cleistogamia: espiguillas cleistógamas aéreas presentes, anteras de 0,2–0,6 mm, lodículas ausentes, raro presentes. Espiguillas cleistógamas axilares presentes, 1–3-floras, de 3,5–15,5 mm de longitud. Brácteas basales de 2–9 mm, membranáceas, con los márgenes finamente ciliados. Artejos de la raquilla de 2–4,5 mm, pilosos. Lema de 3–7 mm, membranácea, glabra, o con pelos ralos en el dorso, lóbulos laterales reducidos a mucrones, o ausentes, arista dorsal de 0,3–2 mm. Pálea de 2–5 mm, membranácea, con

los márgenes ciliados, el resto glabro. Anteras de 0,2–0,3 mm. Cariopsis alargada, café oscura, de 1,7–2,6 × 0,5–1 mm. Embrión de 0,7–1 mm. Hilo de 0,4–0,5(–0,7) mm. Espiguillas cleistógamas en las vainas basales presentes, unifloras. Profilo externo de 3,3–4,5 mm, coriáceo, apiculado, con los márgenes ciliados, el resto glabro. Lema de 2,8–3,5 mm, algo coriácea, glabra, brillante, apiculada. Pálea de 2,5–3 mm, membranácea, glabra, apiculada. Cariopsis elíptica, café clara, de 1,7–1,8 × 0,8–1 mm. Embrión de 0,6–0,7 mm. Hilo de 0,2–0,3 mm.
Distribución: Canadá, Estados Unidos y México.
Hábitat: altamente tolerante a una amplia gama de condiciones climáticas y ambientales. El factor que limita su distribución en Norteamérica parece ser la humedad y la temperatura (DARBYSHIRE & CAYOUETTE 1989). Crece en suelos rocosos secos y estériles, suelos bien drenados, márgenes de bosques y dentro de bosques abiertos, calizas, praderas secas, bofedales, etc. Es una especie de gran distribución en Estados Unidos y Canadá. Presenta una enorme variabilidad en cuanto a sus caracteres morfológicos y biométricos. Sin embargo, la mayoría de los autores actuales no reconocen variedades dentro de esta especie, atribuyendo esto a variaciones debido al medio ambiente en el cual vive esta planta (GOULD 1972; DORE & MCNEIL 1980). Ha sido encontrada ocasionalmente como maleza en campos de cultivo, pero sin causar problemas significativos (PALMER 1930).

Material citado seleccionado:

Canadá. Alberta: North of Fort Saskatchewan, 22.7.1945, *Jurner 4585* (S). – British Columbia: Mount Benson, Vancouver, 13.7.1908, *Macoun 78832* (S) – Nanaimo, 11.7.1887, *Macoun 29884* (K) – 1/4 mile south of Nakusp along Upper Arrow Lake, 3.7.1953, *Calder & Savile 10044* (S). – Manitoba: Gypsumville, 140 miles NW of Winnipeg, 13.7.1951, *Scoggan 9454* (C, K, S) – Near Pointe du Bois, 22.6.1952, *Askell & Löve 5547* (S). – New Brunswick: Bass River, 1.8.1874, *Fowler s.n.* (GOET) – Bathurst and vicinity, 3.7.1926, *Malte 367* (S) – Gloucester County, 13.8.1913, *Blake 5388* (K) – Montagne Albert, Gaspésie, 12.8.1923, *Marie-Victorin et al. 17764* (K) – Sacré Coeur de Rimousky, comté de Rimousky, 31.7.1936, *Rousseau 50476* (G) – St. Andrews, 11.7.1900, *Fowler s.n.* (C). – Newfounland: Blomidon Mountains, Region of Bay of Islands, 24.7.1910, *Fernald & Wiegand 2595* (K) – Grand Falls, Valley of Exploits River, 22.7.1911, *Fernald & Wiegand 4602* (S) – La Trappe, 1.7.1960, *Louis-Marie & Gervais s.n.* (G) – Near Quiddy Viddy, 2.8.1894, *Robinson & Schrenk s.n.* (C, G). – Nova Scotia: Along the road between Donohue Lake and Larry's River, Guysborough County, 11.–12.8.1930, *Rousseau 35429* (C, K, S) – North Lake Alma, Annapolis County, 24.6.1949, *Smith, Collins, Bruce & Sampson 2515* (S) – Shelb County, 30.7.1940, *Dore 973* (K) – St. Paul Island, 12.8.1929, *Perry & Roscoe 66* (K). – Ontario: Blakeney, Lanark County, 5.8.1945, *Minshall 3626* (C) – Brulé Bay, vicinity of Michipicoten Harbour, Algoma District, 2.8.1938, *Hosie, Harrison & Hughes 1563* (S) – Clayton, Lanark County, 21.7.1943, *Dore & Groh 5054* (C) – Kaladar Township, 2 miles north northwest of Kaladar, Lennox & Addington County, 25.6.1952, *Gillet & Calder 6254* (G) – Kingston, Asselstine, 7.7.1966, *Dore & Beschel 15254* (S) – Lake Region, 16.6.1874, *Macoun 1824* (K) – Shady Nook, 3 miles south of Pembroke, Stafford, 9.6.1941, *Groh 1315* (C) – Vicinity of Peninsula, Thunder Bay District, 14.7.1939, Taylor, Bannan & Harrison 883 (S). – Prince Edward Island: Alberton, Prince County, 11.7.1912, *Fernald & John 6869* (K) – Quebec: Baie Missisquoi, 11.7.1929, *Rolland-Germain 29187* (K) – Between St. Lazare and Hudson, just south of Hwy 20, Vaudreuil County, 17.7.1981, *Waterway & Phaneuf 2070* (C) – Plantes de L'ile D'Anticosti, riviere Chicotte, 15.8.1926, *Marie-Victorin & Rolland-Germain 24344* (K) – Port Rouge Station, comté Portneuf, 30.6.1964, *Rousseau 64-675* (G) – Saint Adolphe, comté d'Argenteuil, 23.6.1949, *Rolland-Germain 2355* (C, S) – Saint Honoré, comté Témiscouata, 6.7.1964, *Blouin, Carrier, Lemieux & Richard 7355* (FR). – Saskatchewan: Cypress Hills

Park, 4000 ft, 11.7.1947, *Breitung 4655* (S) – Lake Athabaska, vicinity of the base of Cornwall Bay, 8.7.1935, *Raup 6449* (S).

Estados Unidos. Alaska: Gravine, 3.8.1927, *Anderson 644* (G, K, S). – Arkansas: Between Flippin and Yellville, Marion County, 27.5.1967, *Pohl 10423* (K) – Ozark Mountains, north of Mina, 5.6.1928, *Swallen 946* (SP). – Connecticut: Groton, 20.6.1928, *Jansson s.n.* (S). – Delaware: Ellendale, 13.6.1916, *A. Chase s.n.* (B, C, G, K, S) – Lewes, 18.6.1905, *Hitchcock s.n.* (B, C, G, K, S). – Florida: Near Chattahoochee, 2.6.1897, *Curtiss 5876* (G, K). – Illinois: Dupags County, 26.6.1897, *Moffatt 244* (B) – Kankakee River, VI.1935, *Meebold 19139* (M) – Peoria Heights, Peoria County, 21.6.1958, *V. Chase 15278* (K) – West Chicago, 26.6.1897, *Umbach 16935* (G, M) – 1 mile NW from Dundee, Kane County, 13.6.1959, *Bennett 6818* (G). – Indiana: Bloomington, 3.6.1930, *Weatherwax s.n.* (K) – Clark County, near fire tower on Forestry Farm, 26.5.1933, *Friesner 5604* (S) – Morgan County, 1.3 mile west of Centerton, 29.6.1935, *Friesner 8802* (S). – Iowa. Stearnboat Rock, 14.6.1900, *Pammel s.n.* (G). – Kansas: 3 miles SW of Toronto, 927 ft, 10.6.1939, *Horr E262* (S). – Kentucky: Lexington, 1835, *Short s.n.* (K). – Louisiana: 7.5.1982, *Dale & Dorris 80840* (SP). – Maine: Christmas Cove, 3.7.1903, *Churchill s.n.* (K) – Cushings Island, 27.7.1895, *Fowler s.n.* (C) – Ocean Point, Lincoln County, 14.7.1927, *Fasset 3945* (S). – Maryland: Laurel, 8.6.1958, *Sargent 7647* (FR). – Massachusetts: Along Chicopee River, Hampden County, 27.6.1927, *Seymour G-577* (S) – Cooke Avenue, Northampton, Hampshire County, 25.6.1979, *Ahles 86959* (C) – Middlesex Fells, Winchester, 30.6.1946, *Schubert, Smith & Rouleau* s.n. (B, C, G, K, S). – Michigan: Dalton Township, Muskegon County, 18.6.1950, *Bourdo Jr. 3-987* (C) – Douglas Lake Region, Cheboygan County, 7.7.1933, *Ehlers 5289* (S) – Eagle Harbor, Keweenaw County, 7.7.1936, *Hermann 8132* (K) – Keweenaw County, 17.7.1949, *Richards 2429* (G) – Oceana County, 21.6.1952, *V. Chase 12691* (FR) – Near Hammond Harbor, Presque Isle County, 9.7.1938, *Ehlers 7018* (S) – Silver Mountains, Laird Township, Houghton County, 8.7.1949, *Richards 2307* (S). – Minnesota: Cass Lake, 24.–26.7.1925, *Pammel 182* (B) – Mille Lacs, Milaca, VII.1892, *Sheldon s.n.* (G, S). – Mississippi: Brooklyn, I.1893, *Heuser s.n.* (B). – Missouri: Cooper County, 11.6.1934, *Bush 13659* (S) – Morgan County, 11.7.1934, *Bush 13695* (S) – Pulaski County, 6.6.1989, *Ovrebo & Sladewski W0303* (K) – Seckman, Jefferson County, 1.6.1973, *Christ s.n.* (C) – Spontaneous flora of Arnold Arboretum, 15.6.1942, *Palmer 46146* (BM). – Montana: Fletcher Ranch, 14 miles northeast of Birney, Rosebud County, 4000 ft, 21.7.1955, *Bennett s.n.* (G). – New Hampshire: Conway, 5.8.1927, *Johnson 175* (G) – Mount Washington, 4000 ft, 26.7.1958, *Louis Marie, Löve, Löve & Beaudry s.n.* (S) – Yale Experimental Forest, 27.6.1934, *Smith s.n.* (B, C). – New Jersey: Between New Lisbon and Chatsworth, 8.6.1828, *Leonard & Leonard 6354* (C). – New Mexico: Los Alamos, 2200 m, 3.7.1926, *Arsène 17158* (B) – Mogollon Mountains, near the West Fork of the Gila River, Socorro County, ca. 8500 ft, 23.8.1903, *Metcalfe 558* (G, K) – Philmont Scout Ranch, near Cimarron, Middle Fork Cimarroncito Creek, 1/2 mile west of the Hunting Lodge, Colfax County, 8000 ft, 7.8.1968, *Hartman 2630* (C). – New York: Bronx Park, 9.7.1896, *Nash s.n.* (G) – Jonawanda, Genesee County, 27.6.1926, *Johnson s.n.* (C) – Lake George Region, between Rich's swamp and Lake Lauderdale, Washington County, 18.6.1911, *Dobbin & Burnham 1387* (S) – South side of Peconic River, Long Island, 19.6.1916, *A. Chase s.n.* (B, C, G, K, S). – North Carolina: Altamonte Springs, Winston-Salem, 24.4.1957, *Forsyth 1807* (C) – Blue Ridge Mountains, VI.1841, *Rugel s.n.* (G) – Chatam County, 23.5.1968, *Leonard & Radford 1497* (B, SP) – Near Eno River, NE of Braggtown, Durham County, 13.6.1966, *Radford 44755* (C). – Ohio: Loveland, 13.6.1877, *James 3541* (K) – Near Cincinnati, 9.6.1882, *Lloyd s.n.* (GOET, K) – Near Columbus, 23.6.1939, *Dore 585* (S) – Nördlich von der Stadt St. Marys, ca. 270 m, 2.6.–2.7.1902, *Wetzstein 335* (B, C, FR, G, K) – 1.2 miles northwest of Spruce Pine, Mitchell County, 16.6.1958, *Ahles & Duke 43138* (C). – Oregon: 1871, *Hall 659* (G). – Pennsylvania: Beside road at crest of Shochary Ridge, about 1–3/8 miles S of New Tripoli, Lehigh County, 22.6.1919, *Pretz 9748* (C) – Near Mount Hope, Lancaster County, 5.6.1900, *Heller 4806* (G) – Northeast of Shillington, Berks County, 22.6.1937,

Wilkens 5188 (B, S) – West of Elam, Delaware County, 12.6.1912, *Pennell 3664* (S). – South Carolina: York, 5.6.1957, *Ahles & Haesloop 27117* (K). – South Dakota: 1897, *Griffiths 326* (K) – Deadwood, 7.9.1913, *Carr 23* (FR, G) – Spring Creek, Pennington, 4300 ft, 20.7.1956, *Pase 706* (K) – 25 miles S of Rapid City, 30.6.1943, *Brenckle 43026* (S). – Tennessee: Knox County, 23.7.1919, *Long s.n.* (B) – Roan Mountains, 26.7.1905, *Hitchcock s.n.* (G). – Texas: Dallas, VI.1879, *Reverchon s.n.* (FR). – Virginia: Bedford County, 6.6.1871, *Curtiss s.n.* (G, S) – Near Doyle River Shelter, Shenandoah National Park, 20.7.1946, *A. Chase 12655* (B). – Washington: Briar Ditch Valley, District of Columbia, 20.6.1960, *Leonard 21129* (K) – Brookland, VI.1894, *Holm s.n.* (C, S) – Capitol Heights, 13.6.1926, *Blake 9440* (B, K) – Kettle Falls, Stevens County, 30.6.1939, *Boner & Weldert 186* (S) – Mount Pleasant, 30.5.1905, *Hitchcock s.n.* (C, G, K, S) – White Mountains, 22.7.1922, *Enander s.n.* (S). – Wisconsin: Baileys Harbor, Door County, 22.6.1955, *Bennett s.n.* (G) – Green Bay, 20.6.1881, *Schütte s.n.* (B) – La Pointe, Lake Superior, IX.1858, *Lapham s.n.* (S). – Wyoming: Black Hills, Knowles Ranch, 4200 ft, 28.6.1956, *Pase 615* (K) – On the hot springs formation Gibbon Canyon, Yellowstone National Park, 28.8.1899, *Nelson & Nelson 6745* (C) – Yellow Pine Forest near Newcastle, Weston County, 4.7.1946, *Porter 3966* (S).

México. Hidalgo: Distrito Zacualtipán, roadsides in pine-oak woods between Zacualtipán and Tepeoco, 18.10.1949, *Moore Jr. 5369* (BM) – Municipio Tenango de Doria, ca. 30 km al NNE de Tulancingo, camino entre Metepec y Tenango de Doria, 23 km al norte de Metepec, 2200 m, 18.5.1976, *Koch & Garcia 7689* (IPN, MO). – Puebla: Municipio de Honey, ca. 1 km al NE de Honey, sobre la terracería a Pahuatlán, 18 km directo al NE de Huauchinango, 2050 m, 13.5.1978, *Koch 7824* (M). – Tamaulipas: Cerro Bufa, El Diente, Sierra San Carlos, 1400 m, 23.5.1985, *Briones 1700* (M).

Suele confundirse con *D. compressa*, de la cual difiere por la panícula cerrada y las aristas de los lóbulos de la lema más cortos.

28. ***Danthonia unispicata*** (Thurb.) Munro ex Macoun, Cat. Canad. Pl. 4: 215. 1888 ≡ *Danthonia californica* Boland. var. *unispicata* Thurb., in S. Watson, Bot. California 2: 294. 1880. **Typus**: Estados Unidos. San Diego to San Francisco (Bolander, Parry, Lemon); also in Oregon and in the Rocky Mountains. ≡ *Merathrepta unispicata* (Thurb.) Piper, Contr. U.S. Natl. Herb. 11: 123. 1906. ≡ *Pentameris unispicata* (Thurb.) Nels. & Macbr., Bot. Gaz. 56(5): 470. 1913.

Icones: CRONQUIST et al. 1977, pág. 463; A.S. HITCHCOCK 1951, fig. 422; MUNZ & KECK 1959, fig. 4 (a).
Fig. 4: E

Cañas floríferas 2–5-nodes, de 12–30 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 18 cm de largo, pilosas. Vainas muy pilosas, muy raro glabras, con mechones de pelos de hasta 6 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,5–1,5(–4) mm. Láminas pilosas, de hasta 12 cm de largo por 2–2,5 mm de ancho. Panícula de 1,3–3,7 cm de largo, con 1–2 espiguillas, la mayoría con sólo una. Pedicelos pubescentes, de 6–37(–50) mm de longitud. Espiguillas 3–6-floras, sin considerar el último antecio que es abortivo, la terminal de 13–21 mm. Artejos de la raquilla glabros, de hasta 1 mm. Glumas violáceas a amarillentas, lanceoladas, 5-nervadas, la inferior de 11–21 mm, la superior de 10–18,5 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 8,6–13,5 mm y desde el callo hasta el ápice de la arista dorsal de 13–19 mm, callo piloso, de 0,5–1 mm, pelos de 0,5–2 mm, arista dorsal de 8–12 mm de longitud. Lema pilosa sólo en los márgenes, muy raro glabra, el dorso es glabro. La lema mide desde su base (sin

incluir el callo) hasta el nacimiento de la arista dorsal 4,8–7 mm. Lóbulos laterales de 3–6,5 mm, con aristas de 0,2–2 mm, o solamente un pequeño mucrón. Pálea lanceolada, de 7,5–9,5 × 1,8–2,5 mm, finamente ciliada en los márgenes, el resto glabro, ápice obtuso, truncado o ligeramente bidenticulado. Lodículas 2, flabeliformes, de 0,5–0,8 mm, glabras, raro pilosas, cuando pilosas, los pelos miden de 0,2–0,6 mm. Estambres 3, anteras de 1–4 mm de largo. Ovario de 1–2,5 mm. Estigmas de 2–2,3 mm. Cariopsis elíptica, café clara, de 3–5 × 0,8–1,3 mm. Embrión de 1–2 mm. Hilo de (1,5–)2,8–3,5 mm.
Cleistogamia: espiguillas cleistógamas aéreas no observadas. Espiguillas cleistógamas axilares presentes, 1–3-floras, de 8–30 mm de longitud. Brácteas basales de 5,5–13 mm, membranáceas, con los márgenes finamente ciliados. Artejos de la raquilla de 2,5–14 mm, glabros. Lema de 8–11 mm, algo coriácea, apiculada, con lóbulos laterales de 0,5–2 mm, o mucrones, arista dorsal de 0,8–4 mm, o ausente. Pálea de 6–8,5 mm, membranácea, márgenes finamente ciliados, el resto glabro. Anteras de 0,4–0,5 mm. Cariopsis alargada, café clara, de 5–6 × 0,8–1 mm. Embrión de 2–3 mm. Hilo de 3,5–4,5 mm. Espiguillas cleistógamas en las vainas basales presentes, 1–2-floras. Profilo externo de 7–10,5 mm, coriáceo, con los márgenes ciliados, el resto glabro. Lema de 6,5–10 mm, coriácea, glabra, brillante, apiculada. Pálea de 6–7 mm, membranácea, glabra, apiculada. Cariopsis alargada, café clara, de 4–5 × 0,9–1 mm. Embrión de 1,8–2 mm. Hilo de 3–3,5 mm.
Distribución: Canadá y Estados Unidos.
Hábitat: crece en praderas secas, ocasionalmente en praderas húmedas, en lugares abiertos, pie y faldas de cerros, terrenos arenosos, en fisuras sobre rocas.

Material citado seleccionado:

Canadá. Alberta: Twin River, Ecological Reserve S. Alberta, 21.7.1980, *Aiken & Darbyshire 1465* (K). – Saskatchewan: Cypress Hills, VIII.1884, *Macoun 29929* (S) – Swift Current, 22.6.1947, *Breitung 3993* (S).

Estados Unidos. California: Burney Park, Shasta County, 3.6.1946, *Hoffman 1801* (B) – Eagle Lake, 27 miles from Susanville, 5000 ft, 30.6.1897, *Jones s.n.* (BM) – El Dorado County, 7000 ft, 5.8.1888, *Heller 12147* (G) – Harvey Valley Dixie, Lassen County, 5600 ft, 7.9.1968, *Gierisch 3353* (BM) – North side of Emigrant Lake, Tuolumne County, 2.8.1940, *Hoover 4493* (BAA, K) – Sierra Nevada, Soldier Lake, Tulare County, 11000 ft, 6.8.1949, *Howell 26092* (G). – Colorado: Whisky Springs Ranch, 4 miles above Greystone on Zenobia Peak Road, Moffat County, 7500 ft, 25.6.1965, *Weber & Salamun 12587* (C, FR, S). – Idaho: Bonanza, Custer County, 7500 ft, 27.7.1916, *Macbride & Payson 3453* (K) – House Creek, Owyhee County, 30.6.1912, *Nelson & Macbride 1830* (S). – Missouri: Rocky Mountains, VIII.1845, *Geyer 189* (K). – Montana: Bridger Range, Gallatin County, ca. 7000 ft, 4.7.1940, *Swallen 6439* (K) – Outward gravelly benches bordering Blackfoot River, ca. 16 miles west of lincoln on Ovando Road, Powell County, 26.6.1945, *Hitchcock & Muhlick 11585* (S). – Oregon: Camp at Dry Creek, Crook County, 1410 m, 27.1.1894, *Leiberg 338* (BM, K) – Gravelly slopes west of Maggot Springs, southeast of Dayville, Grant County, 4600 ft, 2.7.1953, *Cronquist 7359* (C, G, S) – Jumper Springs, Mathew County, 1310 m, 15.6.1896, *Leiberg 2269* (K). – Washington: Pullman, Whitman County, VI.1898, *Elmer 1327* (K) – South side of Field's Spring State Park, 5 miles south of Anatone, Asotin County, 19.6.1949, *Cronquist 5879* (S) – West Kootenay, from Fort Colville to Rocky Mountains, VI.1861, *Lyall s.n.* (K). – Wyoming: Antelope Basin, Albany County, 8.7.1900, *Nelson 7468* (BM, K) – Clarks Fork of the Yellowstone River near mouth of Crazy Woman Creek, Shoshone National Forest, Park County, 7000 ft, 26.7.1937, *Williams 3692* (G).

Especie muy bien definida. Puede ser confundida con *D. californica*, de la cual se diferencia por poseer 1–2 espiguillas por panícula y por el menor tamaño de los escapos florales.

Especie insuficientemente conocida

Danthonia cernua Doell, Fl. Bras. 2(3): 101. 1878, se considera una especie insuficientemente conocida. Además de la descripción original, que no entrega suficiente información para considerarla como una buena especie o sinonimizarla con otra, no existen mayores antecedentes sobre este taxón. Tampoco se conoce el lugar donde está depositado el material typus.

Rytidosperma Steud., Syn. Pl. Glumac. I: 425. 1854.

= *Notodanthonia* Zotov, New Zealand J. Bot. 1: 104. 1963. Holotypus: Akaroa, *E. Raoul* (P; Iso: K).

Plantas herbáceas, perennes, hasta 62 cm de altura, con hojas convolutas o conduplicadas, lineares, erguidas o recurvadas, vainas más cortas que los entrenudos, con pelos largos al costado de la lígula. Lígula pilosa. Láminas glabras o pilosas. Inflorescencia una panícula. Espiguillas plurifloras, casmógamas, normalmente no se desarrollan inflorescencias cleistógamas axilares. Artejos de la raquilla glabros, visibles. Glumas 2, lineares, lanceoladas, o linear-lanceoladas, subiguales, más o menos agudas, raro ovadas u obtusas, membranosas, con margen hialino, redondeadas en la base, plurinervadas, con numerosos nervios transversales, generalmente violáceas o verdosas. Lema pilosa, con pelos agrupados en fascículos dispuestos transversalmente, la serie superior generalmente bien visible, la inferior a veces rala e irregular. Apice de la lema con 2 lóbulos laterales terminados en una pequeña arístula o en una arista larga y recta. Arista dorsal de posición central, plana, con la base retorcida, a menudo mayor que el largo del antecio. Pálea membranácea, o coriácea, pilosa, los márgenes finamente ciliados, ápice emarginado, truncado, obtuso, agudo, bimucronado, 2–4-denticulado, o subtridenticulado. Callo aplanado, corto, piloso. Lodículas 2, cuneadas, generalmente con largos cilios, siempre pilosas. Estambres 3. Ovario con 2 estilos que persisten en el ápice del fruto. Estigmas 2, plumosos. Cariopsis libre, ovoide a elíptica. Embrión más o menos igual a la mitad del largo de la cariopsis. Hilo oval o algo elíptico.

Especie tipo: **Rytidosperma lechleri** Steud.

Etimología: el nombre del género proviene del griego *rhytidos*: rugoso y *sperma*: semilla.

Distribución: género ampliamente distribuído en Australia, Nueva Zelandia, Tasmania y Sudáfrica. También presente en Argentina y Chile.

Clave para la determinación de las especies

1 Hilera superior de fascículos de la lema con 2–5 haces de pelos, planta endémica de Isla de Pascua 2. ***R. paschale***

– Hilera superior de fascículos de la lema con 8–10 haces de pelos, plantas del continente 2
2 Glumas linear-lanceoladas, muy agudas 6. ***R. violaceum***
– Glumas lanceoladas 3
3 Hilera inferior de fascículos de la lema poco definidos, con una baja densidad de pelos, a veces sólo hay pelos ralos. 4
– Hilera inferior de fascículos de la lema bien definidos, con una alta densidad de pelos 5
4 Apice de la pálea bimucronado, plantas muy pilosas 4. ***R. pictum*** var. ***bimucronatum***
– Apice de la pálea obtuso, 2–4-denticulado, truncado o algo agudo, las carinas nunca prolongadas en mucrones, plantas glabras a pilosas ralas 3. ***R. pictum*** var. ***pictum***
5 Pálea de 2,3–4 mm de largo, aristas de los lóbulos de la lema de 0,2–2 mm, largo de la lema desde el callo hasta las aristas de los lóbulos 3,6–7(–8) mm 6
– Pálea de (4–)4,7–6,5 mm de largo, aristas de los lóbulos de la lema de 1,8–5(–5,8) mm, largo de la lema desde el callo hasta las aristas de los lóbulos 7,5–14(–15) mm 7
6 Apice de la pálea agudo, vainas muy pilosas 5. ***R. sorianoi***
– Apice de la pálea obtuso o levemente bidenticulado, vainas glabras, muy raro con pelos en los márgenes 1. ***R. lechleri***
7 Apice de la pálea obtuso a subtridenticulado, vainas pilosas a pilosas ralas 8. ***R. virescens*** var. ***parvispiculum***
– Apice de la pálea 2–3-denticulado, vainas glabras 7. ***R. virescens*** var. ***virescens***

Descripciones

1. ***Rytidosperma lechleri*** Steud., Syn. Pl. Glumac. I: 425. 1854. **Holotypus**: Chile. Prov. Valdivia, ad scatarigines Sichahue in Cordillera de Ranco, III.1852, *Lechler 782* (P; Iso: GOET!, K!). ≡ *Notodanthonia lechleri* (Steud.) Veldk., Taxon 29: 297. 1980.
= *Danthonia glabra* Phil., Anales Univ. Chile 94: 30. 1896. Typus: Chile. In Andibus provinciae Talca, invenit februario 1879, *F. Philippi*. ≡ *Rytidosperma glabrum* (Phil.) Nicora, Darwiniana 18: 87. 1973.

Icones: DERTSCHENY 1989; NICORA 1973, fig. 2 (a–f); NICORA 1978, fig. 14.
Fig. 11: A–C

Cañas floríferas 1–4-nodes, de 6–40 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 26 cm de largo, glabras, muy raro pilosas ralas. Vainas glabras, raro con pelos en los márgenes, con mechones de pelos de hasta 2,5 mm a ambos costados de la lígula, a veces ausentes. Lígula pestañosa, con pelos de 0,3–0,6 mm. Láminas glabras, raro pilosas ralas, de hasta 11 cm de largo por 1–2 mm de ancho. Panícula de 1,8–4,8(–5,5) cm de largo, con 5–36 espiguillas. Pedicelos pubescentes, de 0,5–6 mm de longitud. Espiguillas 2–5-floras, sin considerar el último antecio estéril, la terminal de 5,5–13 mm. Artejos de la raquilla glabros, de 0,5–1,2 mm. Glumas violáceas a café verdosas, lanceoladas, 3, 5-nervadas, la inferior de 5,5–11,5 mm, la superior de 5–11 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 3,6–7(–8) mm y desde el callo hasta el ápice de la arista dorsal de 4,5–9(–11) mm, callo piloso, de 0,3–0,4 mm, pelos de 0,3–1(–1,5) mm, arista dorsal de 3–7(–8) mm de longitud. Lema pilosa en el dorso, con pelos fasciculados dispuestos en 2 hileras paralelas bien definidas, la superior con 9–10 fascículos,

los pelos miden 2–3,5 mm de largo, la inferior con 8–10 fascículos, los pelos miden 0,8–1,5(–2) mm, a veces hay pelos ralos entre ambas hileras, pero es raro, los fascículos superiores presentan una alta densidad de pelos, los inferiores a veces algo ralos. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 1,5–3 mm. Lóbulos laterales de 1,6–5 mm, con aristas de 0,2–2 mm. Pálea lanceolada, de 2,3–4 × 0,6–1,2 mm, carinas finamente ciliadas, el dorso con pelos ralos de 0,4–0,8 mm desde la base hasta la zona medial, o glabro en la madurez, también con pelos ralos en los bordes, de 0,5–1 mm, a veces ausentes en la madurez, ápice obtuso, truncado o ligeramente 2–3-denticulado. Lodículas 2, cuneadas, de 0,3–0,5 mm, pilosas, pelos de 0,2–0,8 mm. Estambres 3, anteras de 0,5–0,7 mm. Ovario de 0,5–1 mm. Estigmas de 1–2 mm. Cariopsis elíptica, café clara, de (0,8–)1–2 × 0,4–0,8 mm. Embrión de (0,3–)0,5–1 mm. Hilo de 0,3–0,6(–0,8) mm. Espiguillas cleistógamas no observadas.
Distribución: Argentina y Chile.
Hábitat: crece en suelos volcánicos, bordes de mallines, vegas, siempre a altitudes superiores a los 1000 m.

Material citado seleccionado:

Argentina. Prov. Chubut: Depto. Tehuelches, Lago Vintter, ladera lado sur, 1.2.1992, *Nicora 9694* (MO) – Mountain La Torta, Rivadavia Range, Parque Nacional Los Alerces, north side of Lago Futalaufquén, 30.3.1952, *Beetle & Soriano 381* (MO). – Prov. Mendoza: Atuel Valley near Campamento Atuel, 2500 m, 27.12.1955, *Böcher, Hjerting & Rahn 1882* (BAA, C) – Depto. Malargüe, Paso Pehuenche, sobre el límite con Chile, 30.1.1963, *Boelcke, Bacigalupo & Correa 10374* (BAA, SI, SP). – Prov. Neuquén: Depto. Catán Lil, Sierra del Chachil, 30.1.1965, *Rugolo & Agrasar 437* (BAA) – Depto. Chos Malal, Riscos Bayos, 1750–1850 m, 25.1.1964, *Boelcke, Correa, Bacigalupo et al. 11201* (BAA, SI) – Depto. Los Lagos, camino al Port. Puyehue, a 5 km del límite con Chile, 18.2.1985, *Rugolo 1086* (SI) – Depto. Minas, extremo norte de la Laguna Varvarco Campos, arroyo Benítez, 31.1.1970, *Boelcke et al. 14220* (BAA, SI) – Depto. Ñorquín, Copahue, I.1941, *Herrero 107* (BAA) – Parque Nacional Nahuelhuapi, cerca del Refugio del Cerro Colorado, 1600 m, 7.2.1944, *Diem 770* (SI, SP) – Paso Pino Hachado, 12.2.1941, *Perez Moreau s.n.* (BA). – Prov. Río Negro: Región montañosa cercana al lago Nahuelhuapi, Cerro López, 1600 m, 30.1.1934, *Parodi 11529* (BAA).

Chile. **IV Región**. Prov. Limarí: Cordillera de Ovalle, Vegas San Miguel, 3100 m, 13.1.1959, *Jiles 3624* (CONC) – Ovalle, río Molles, 3200 m, 4.2.1962, *Jiles 4138* (CONC). – **Región Metropolitana de Santiago**. Prov. Area Metropolitana de Santiago: San Gabriel, Cajón del Maipo, 2500 m, *Gunckel 21449* (CONC) – Volcán Maipo, 3300 m, II.1950, *Morales s.n.* (CONC). – **V Región**. Prov. Los Andes: Cordillera de Los Andes, Los Maitenes, 2200 m, 31.12.1965, *Zöllner 757* (CONC) – Saladillo, vega bajo Hilton, lado estero de Castro, sector mina, 2700 m, 4.1.1991, *Arroyo et al. 91063, 91070* (CONC). – **VII Región**. Prov. Curicó: Paso Vergara, 2500 m, 11.3.1967, *Marticorena & Matthei 1007, 1009* (CONC) – Potrero Grande, 26.1.1947, *E. Barros 6386* (BAA). – Prov. Talca: Cordillera de Talca, II.1885, *F. Philippi s.n.* (SGO, W) – El Picazo, El Alto de la laguna, 26.1.1939, *E. Barros 387, 447* (BAA) – Paso Pehuenches, límite chileno-argentino, 2450 m, 30.1.1994, *Villagrán 8205* (CONC). – **VIII Región**. Prov. Ñuble: Valle de Las Nieblas, prope Thermas Chillanensis, I.1894, *F. Philippi s.n.* (W). – **IX Región**. Prov. Cautín: Lonquimay, Cordillera de Las Raíces, 2.3.1939, *Burkart 9527* (BAA, SI) – Villarica, Andes, 1897, *Neger s.n.* (M). – Prov. Malleco: Cordillera de Nahuelbuta, Fundo Solano, Los Alpes, ca. 1200 m, 26.1.1958, *Eyerdam 10224* (NY) – Parque Nacional Nahuelbuta, Laguna las Totoras, 4.12.1990, *Baeza 218* (CONC). – **X Región**. Prov. Llanquihue: Volcán Yate, ca. 1300 m, III.1924, *Werdermann 1684* (S). – Prov. Osorno: Antillanca, cráter cerro Colorado, 1220 m, 21.1.1981, *Schlegel 7329* (CONC) – Antillanca, cráter Rayhuén, 17.1.1991, *Baeza 233* (CONC). – Prov. Valdivia: Ad scatarigines Sichahue in Cordillera de Ranco, III.1852, *Lechler*

782 (GOET, K) – Andes de Valdivia, 1000–1800 m, I.1897, *F. Philippi s.n.* (W) – Fundo Trafún, Volcán Quetrupillán, 1300 m, 20.3.1982, *Schlegel 7500* (CONC)

Se adopta el nombre *R. lechleri* para este taxón, luego de revisar isotypus depositados en los herbarios de Göttingen y Viena. Muchas de las flores de estos especímenes estaban infectadas por una larva, sin embargo, también habían flores no infectadas. Estos especímenes resultaron ser idénticos a *R. glabrum*, de manera que este último nombre pasa a la sinonimia.

2. ***Rytidosperma paschale*** (Pilger) C.M.Baeza, Gayana, Bot. 47(3–4): 84. 1990 ≡ *Danthonia paschalis* Pilger, in Skottsberg, Nat. Hist. Juan Fernandez 2: 67. 1922. **Lectotypus**: Chile. Isla de Pascua, on the slope of Mountain Katiki, 16.6.1917, *Skottsberg & Skottsberg 658* (B!; Iso: S!).

Icon: SKOTTSBERG 1922, lám. 1 (d–h).
Fig. 11: L–M

Cañas floríferas 2–5-nodes, de 10–60 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 40 cm de largo, pilosas ralas. Vainas pilosas ralas, con mechones de pelos de hasta 3 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,3–0,5 mm. Láminas pilosas ralas, de hasta 23 cm de largo por 0,8–1,5 mm de ancho. Panícula de 2,5–8,5 cm de largo, con 3–10(–15) espiguillas. Pedicelos pubescentes, de 1–9(–16) mm de longitud. Espiguillas 5–8-floras, sin considerar el último antecio estéril, la terminal de 11–14,5 mm. Artejos de la raquilla glabros, de 0,2–0,3 mm. Glumas verdosas a café claras, lineares, la inferior de 6,5–10 mm, 6, 7, 9-nervada, la superior de 5–9,5 mm, 5–7-nervada, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 7,5–9 mm y desde el callo hasta el ápice de la arista dorsal de 10,5–12 mm, callo piloso, de 0,6–1 mm, pelos de 0,3–1(–1,3) mm, arista dorsal de 7–9 mm. Lema pilosa en el dorso, con pelos fasciculados dispuestos en 2 hileras paralelas, la superior con 2–5 fascículos, los del margen persistentes durante la madurez, los restantes caedizos, los pelos miden 1,5–2 mm, la inferior con 9–10 fascículos bien definidos, los pelos miden 1,3–1,8 mm. La lema mide desde su base (sin incluir el callo) hasta la inserción de la arista dorsal 2,5–3,2 mm. Lóbulos laterales de 4–5,4 mm, con aristas de 1,5–3,3 mm. Pálea lanceolada, de 2,9–3,5 × 0,8–1 mm, carinas finamente ciliadas, con el dorso glabro en la madurez, raro piloso, cuando hay pelos, éstos son ralos y miden 0,2–0,3 mm, bordes glabros en la madurez, o raramente hay pelos de hasta 0,5 mm, ápice bidenticulado. Lodículas 2, cuneadas, de 0,4–0,5 mm, pilosas, pelos de 0,1–0,5 mm. Estambres 3, anteras cleistógamas de 0,3–0,6 mm. Ovario de 0,5–0,7 mm. Estigmas de 1–1,5 mm. Cariopsis elíptica, café clara, de 1,3–1,9 × 0,6–1 mm. Embrión de 0,5–0,8 mm de largo. Hilo de 0,3–0,5 mm. Sólo se ha observado presencia de espiguillas cleistógamas aéreas.
Distribución: especie endémica de Isla de Pascua.
Hábitat: crecía en las laderas del monte Katiki, pero en la actualidad sólo se encuentra en el cráter apagado del volcán Rano Kao (ZIZKA 1990, 1991).

Material citado seleccionado:

Chile. **V Región**. Prov. Isla de Pascua: Abhang des Katiki, 16.6.1917, *Skottsberg & Skottsberg 658* (B; S!) – Rano Kao, interior del cráter, 200 m, VI.1981, *Etienne s.n.* (CONC) – Rano Kao, nahe dem Kratersee, 2.5.1988, *Zizka 490* (FR, SGO) – Rano Kao, Nordwesthang, 15.1.1991, *Zizka 1375* (FR).

Es una especie bastante diferente del resto del grupo, respecto tanto a la disposición de los fascículos de pelos en el dorso de la lema, como por la presencia de espiguillas cleistógamas aéreas, carácter muy raro en el género. Los pelos en el dorso y márgenes inferiores de la pálea son generalmente caedizos en la madurez, pero siempre están presentes en estados inmaduros.

3. ***Rytidosperma pictum*** (Nees & Meyen) Nicora var. ***pictum***, Darwiniana 18: 91. 1973 ≡ *Danthonia picta* Nees & Meyen, Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur. 19, Suppl. 1: 157. 1843. **Holotypus**: Chile. Cordillera de San Fernando, río Tinguiririca, 8–9000!, *Meyen s.n.* (P; Iso: B!) ≡ *Notodanthonia picta* (Nees & Meyen) Veldk., Taxon 29: 297. 1980.

Icones: DERTSCHENY 1989; NICORA 1973, fig. 3 (a–d); NICORA 1978, fig. 17.
Fig. 11: G–I

Cañas floríferas 1–4-nodes, de 8–48 cm de altura. Innovaciones intra o extravaginales. Hojas basales de hasta 22 cm de largo, glabras, a veces pilosas. Vainas glabras, a veces pilosas, con mechones de pelos de hasta 3(–5) mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,3–1 mm. Láminas glabras, a veces pilosas, de hasta 15 cm de largo por 1–3 mm de ancho. Panícula de 1,8–8,5 cm de largo, con (2–) 5–38 espiguillas. Pedicelos pubescentes, de 0,5–10 mm de longitud. Espiguillas 3–4-floras, sin considerar el último antecio estéril, la terminal de 11–17 mm. Artejos de la raquilla glabros, de 0,5–1 mm. Glumas violáceas a café verdosas, lanceoladas, 3, 5, 7-nervadas, la inferior de 9–15 mm, la superior de 9–14 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 7–11,5 mm y desde el callo hasta el ápice de la arista dorsal de 10–15,5 mm, callo piloso, de 0,3–0,7 mm, pelos de 0,3–1,5(–2) mm, arista dorsal de 7–12,5 mm de longitud. Lema pilosa en el dorso, con pelos fasciculados dispuestos en 2 hileras paralelas, la superior con (8–)9–10 fascículos bien definidos, los pelos miden 3,5–5,5 mm, la inferior con 8–10 fascículos poco definidos, con baja densidad de pelos, los fascículos de los márgenes siempre bien notorios, los pelos miden 1–2 mm, siempre hay pelos cortos entre ambas hileras paralelas. La lema mide desde su base (sin incluir el callo) hasta la inserción de la arista dorsal 2,5–3 mm. Lóbulos laterales de 4–8 mm, con aristas de 1–3,3 mm. Pálea lanceolada, de 4–5 × 0,7–1 mm, carinas finamente ciliadas, el dorso con pelos ralos de 0,4–1 mm desde la base hasta la zona medial, también con pelos ralos y escasos en los bordes, de 0,4–2 mm, a veces ausentes en la madurez, ápice obtuso, 2–4-denticulado, truncado o ligeramente agudo. Lodículas 2, cuneadas, de 0,4–0,6 mm, muy pilosas, pelos de 0,3–1 mm. Estambres 3, anteras de 1–2,2 mm. Ovario de 0,8–0,9 mm. Estigmas de 1,5–2,5 mm de longitud. Cariopsis elíptica, café clara, de 1,7–2 × 0,7–1 mm. Embrión de 0,9–1 mm. Hilo de 0,5–0,6 mm. Espiguillas cleistógamas no observadas.
Distribución: Argentina y Chile.
Hábitat: crece en pedregales, roqueríos, suelo arenoso, escoria volcánica, arroyos de deshielo, a altitudes superiores a los 1000 m.

Material citado seleccionado:

Argentina. Prov. Mendoza: Depto. Malargüe, Valle Hermoso, Portezuelo NE entrada al Valle, 2550 m, 28.1.1963, *Boelcke, Bacigalupo & Correa 10293* (BAA, SI) – Depto. San Rafael, Alto Valle del Atuel, Laguna Atuel, 2970–3030 m, 6.–8.2.1955, *Ruiz Leal 16887* (BAA). – Prov. Neuquén: Cordillera del río Colorado, filo entre Cerro Ventana y Cerro Curva, 1600 m, 19.2.1940, *Diem 257* (SI) – Depto. Lácar, San Martín de Los Andes, Parque Nacional

Lanín, Cerro Chapelco, 11.2.1961, *León & Calderón 837, 844* (BAA) – Depto. Los Lagos, near Villa La Angostura, 19.2.1952, *Pedersen 1558* (C) – Depto. Minas, extremo norte de la Laguna Varvarco Campos, cajón Benítez, paso Puerta Vieja, 2500 m, 1.2.1970, *Boelcke et al. 14304* (BAA, SI) – Depto. Ñorquín, Copahue, I.1932, *Schauffele s.n.* (BAA) – Depto. Ñorquín, Copahue, 14.2.1941, *Perez Moreau s.n.* (BAA, BA) – Lago Quillén, extremo W, 1.2.1963, *Valla et al. 3171* (BAA) – Parque Nacional Nahuelhuapi, Refugio Cerro Colorado, 14.2.1953, *Boelcke & Correa 6887* (BAA). – Prov. Río Negro: Depto. Bariloche, Lago Nahuelhuapi, Cerro Catedral, III.1943, *Soriano 261* (BAA) – Parque Nacional Nahuelhuapi, Ventisquero Frías, 13.1.1952, *Boelcke & Correa 5500 1/2* (BAA).

Chile. **IV Región**. Prov. Limarí: Combarbalá, Potrero Grande, 2600 m, 6.1.1963, *Jiles 4429* (CONC). – **Región Metropolitana de Santiago**. Prov. Area Metropolitana de Santiago: Entre Lo Valdés y La Yesera, 2450 m, 11.2.1963, *Ricardi, Marticorena & Matthei 845* (CONC) – Potrero Grande, 1780 m, *Zöllner 2123* (CONC) – río Yeso, Laguna Pinquenes, 2500 m, 13.1.1945, *Biese 873, 874* (FR). – Prov. Chacabuco: Alto del Roble, Hacienda de Chicauma, 1600–2160 m, 26.12.1983, *Villagrán 4744* (CONC). – Prov. Melipilla: Cerro Cantillana, 1900–2300 m, 15.12.1979, *Villagrán & Meza 2104* (CONC). – **V Región**. Prov. Los Andes: Saladillo, sector tranque Piuquenes, 2200 m, 8.1.1991, *Arroyo et al. 91261* (CONC). – Prov. San Felipe de Aconcagua: Cerro Chache, 5 hours by horse southeast of Patagua Mine, 18 km east of La Ligua, 2200 m, 29.12.1938, *Morrison 17026* (K). – Prov. Valparaíso: Cerro Vizcacha, 26.11.1943, *Boelcke 2360* (BAA). – **VI Región**. Prov. Colchagua: Cordillera de San Fernando, río Tinguiririca, 8–9000 ft, *Meyen* s.n. (B). – **VII Región**. Prov. Curicó: Camino de Curicó a la Laguna de Teno, 3 km antes de la laguna, 2520 m, 29.3.1973, *Marticorena, Matthei & Rodríguez 73* (CONC) – Camino de Curicó a Paso Vergara, 19 km al interior de los Queñes, 950 m, 9.3.1967, *Marticorena & Matthei 807* (CONC). – Prov. Linares: Laguna Dial, 1520 m, 25.1.1961, *Schlegel 3676* (CONC). – Prov. Talca: Cordillera de Talca, II.1879, *F. Philippi s.n.* (BM) – Laguna Maule, 2190 m, 19.1.1961, *Schlegel 3460* (CONC). – **VIII Región**. Prov. Biobío: Antuco, Cerro Pilque, 18.2.1935, *E. Barros 425* (BAA) – Laguna del Laja, sector Las Lagartijas, 29.12.1990, *Baeza 219 b, 223* (CONC). – Prov. Ñuble: Near Termas de Chillán, on the way to the Potrero del Sol, ca. 2500 m, 17.1.1986, *Pedersen 14264* (C, MO) – Termas de Chillán, sector Aguas Calientes, ca. 1800 m, 7.1.1989, *Baeza 179, 180 a* (CONC) – Yungay, Fundo Baquedano, Santa Lucía, 4.–9.2.1957, *Artigas s.n.* (BAA, CONC). – **IX Región**. Prov. Cautín: Curacautín, Termas de Tolhuaca, ca. 1300 m, 20.2.1935, *Montero 2188* (CONC) – Laguna Captrén, ribera sur, 1260 m, 20.1.1976, *Marticorena, Quezada & Rodríguez 826* (CONC) – Volcán Llaima, 1300 m, 4.–7.1.1943, *Gunckel 13969* (CONC) – Volcán Villarrica, Refugio, 1300 m, 11.1.1945, *Montero 4141* (BAA, CONC). – Prov. Malleco: Parque Nacional Nahuelbuta, entre el centro del Parque y la entrada al camino a Pichinahuel, 1300 m, 9.1.1968, *Ricardi, Marticorena & Matthei 1944* (B) – Termas de Tolhuaca, 1000 m, 3.1.1947, *Gunckel 16024* (BAA, CONC) – Termas río Blanco, camino Piedra El Sapo, ca. 1200 m, 9.2.1945, *Montero 4396* (BAA, CONC). – **X Región**. Prov. Llanquihue: Parque Nacional Vicente Pérez Rosales, 1971–1975, *Villagrán 446, 447, 449* (GOET). – Prov. Valdivia: Laguna Los Patos, interior del Fundo Trafún, 1300 m, 20.3.1982, *Schlegel 7500* (CONC) – Valdivia, auf andinen Wiesen, 1000–1800 m, II.1897, *F. Philippi s.n.* (W). – **XII Región**. Prov. Magallanes: Estación Fenton, 18.10.1956, *Roehrs s.n.* (HIP).

Un carácter típico de esta especie es la baja densidad de pelos en la hilera inferior de fascículos de la lema, incluso muchas veces están sólo insinuados. Sin embargo, los fascículos laterales siempre son bien visibles, con una alta densidad de pelos.

4. ***Rytidosperma pictum*** (Nees & Meyen) Nicora var. ***bimucronatum*** Nicora, Darwiniana 18: 91. 1973. **Holotypus**: Argentina. Neuquén, Depto. Lácar, Cerro Malo, *Rúgolo & Agrasar 313* (BAA) ≡ *Notodanthonia picta* (Nees & Meyen) Veldk. var. *bimucronata* (Nicora) Veldk., Taxon 29: 297. 1980.

Icon: NICORA 1973, fig. 3 (e).
Fig. 11: J–K

Cañas floríferas 1–3-nodes, de 6–20 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 15 cm de largo, pilosas. Vainas glabras, con mechones de pelos de hasta 3 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,5–1 mm. Láminas pilosas, de hasta 7,5 cm de largo por 1–1,5 mm de ancho. Panícula de 1,8–3,7 cm de largo, con 2–7 espiguillas. Pedicelos pubescentes, de 0,5–7 mm de longitud. Espiguillas 2–3-floras, sin considerar el último antecio estéril, la terminal de 11–15 mm. Artejos de la raquilla glabros, de 0,8–1 mm. Glumas violáceas a café verdosas, lanceoladas, 5-nervadas, la inferior de 9–13 mm, la superior de 9–12,5 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 7,5–10 mm y desde el callo hasta el ápice de la arista dorsal de 11–14 mm, callo piloso, de 0,4–0,7 mm, pelos de 0,3–1,2 mm, arista dorsal de 7,5–10,5 mm de longitud. Lema pilosa en el dorso, con pelos fasciculados dispuestos en 2 hileras paralelas, la superior con 10 fascículos bien definidos, los pelos miden 3,5–4,5 mm, la inferior con 8–10 fascículos poco definidos, con baja densidad de pelos, los pelos miden 1–1,5 mm, siempre hay pelos cortos entre ambas hileras paralelas. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 2,5–2,8 mm. Lóbulos laterales de (3,5–)4–6,3 mm, con aristas de (0,3–)1,2–3 mm. Pálea lanceolada, de 4–4,5 × 0,8–1 mm, carinas finamente ciliadas, el dorso con pelos ralos de 0,3–0,7 mm desde la base hasta la zona medial, también con pelos ralos y escasos en los bordes, de 0,4–1,4 mm, ápice bimucronado. Lodículas 2, cuneadas, de 0,3–0,6 mm, pilosas, pelos de 0,2–0,8 mm. Estambres 3, anteras de 1–1,8 mm. Ovario de 0,8–1 mm. Estigmas de 1,4–2 mm. Cariopsis elíptica, café clara, de 2–2,2 × 0,8–1 mm. Embrión de 1–1,3 mm. Hilo de 0,7–0,8 mm. Espiguillas cleistógamas no observadas.
Distribución: esta variedad crece únicamente en Argentina.
Hábitat: crece en fisuras entre las rocas, a altitudes superiores a los 1000 m.

Material estudiado:

Argentina. Prov. Neuquén: Depto. Lácar, Parque Nacional Lanin, Cerro Chapelco, San Martin de Los Andes, 2000 m, 12.2.1961, *León & Calderón 876, 905, 910* (BAA) – Parque Nacional Nahuelhuapi, filo Refugio Cerro Colorado, 15.2.1953, *Boelcke & Correa 6957* (BAA) – Parque Nacional Nahuelhuapi, Villa La Angostura, filo Cerro Bayo, 1782 m, 8.2.1983, *Cusato 2634* (BAA).

Se diferencia de la variedad típica por la mayor pilosidad de la planta, el menor tamaño, y por el ápice de la pálea bimucronado.

5. ***Rytidosperma sorianoi*** Nicora, Darwiniana 18: 89. 1973. **Holotypus**: Argentina. Chubut, Depto. Río Senguerr, Mallín de Vera, *Soriano 4490* (BAA) ≡ *Notodanthonia sorianoi* (Nicora) Veldk., Taxon 29: 297. 1980.

Icones: NICORA 1973, fig. 2 (g–l); NICORA 1980, fig. 15.
Fig. 11: D–F

Cañas floríferas 2–3-nodes, de 7–25 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 8 cm de largo, pilosas. Vainas pilosas, con mechones de pelos de hasta 3 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,5–1(–1,5) mm. Láminas pilosas, de hasta 5 cm de largo por 1,2–2 mm de ancho. Panícula de 1,4–3,2 cm de largo, con 3–12(–17) espiguillas. Pedicelos pubescentes, de 0,5–7 mm de longitud. Espiguillas 3–4-floras, sin considerar el último antecio estéril, la terminal de 6,5–10 mm. Artejos de la raquilla glabros, de 0,5–0,9 mm. Glumas café verdosas, lanceoladas, anchas, 3-nervadas, de 6–10 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 5–6 mm y desde el callo hasta el ápice de la arista dorsal de 5,8–7 mm, callo piloso, de 0,3–0,5 mm, pelos de 0,5–0,8 mm, arista dorsal de 3,8–4,5 mm. Lema pilosa en el dorso, con pelos fasciculados dispuestos en 2 hileras paralelas bien definidas y con una alta densidad de pelos, la superior con 10 fascículos, los pelos miden 3–3,5 mm de largo, la inferior también con 10 fascículos, los pelos miden 1,5–1,6 mm de largo, siempre hay numerosos pelos entre ambas hileras paralelas. La lema mide desde su base (sin incluir el calllo) hasta el nacimiento de la arista dorsal 2–2,5 mm. Lóbulos laterales de 2,7–3,4 mm, con aristas de 0,7–1,5 mm. Pálea lanceolada, de 3,3–3,8 × 1–1,2 mm, carinas finamente ciliadas, el dorso con abundantes pelos de 0,5–1,2 mm desde la base hasta la zona medial, también con numerosos pelos en los bordes, de 0,5–1,5 mm, ápice agudo y alargado. Lodículas 2, cuneadas, de 0,3–0,5 mm, pilosas, pelos de 0,3–0,7 mm. Estambres 3, anteras de 0,5–0,8 mm. Ovario de 0,7–1 mm de largo. Estigmas de 1,2–1,5 mm. Cariopsis ovoide, café clara u oscura, de 1,5–1,8 × 0,8–1 mm. Embrión de 0,7–0,9 mm. Hilo de 0,4–0,6 mm. Espiguillas cleistógamas no observadas.
Distribución: especie endémica de Argentina.
Hábitat: crece en los sectores más secos del borde de los mallines en río Negro y Chubut (NICORA 1973).

Material citado seleccionado:

Argentina. Prov. Chubut: Depto. Escalante, Cañadón Tordillo, 6.2.1932, *Castellanos 9955* (BAA, BA) – Depto. Languiñeo, Tecka, 17.1.1947, *Soriano 2419* (BAA, SI) – Depto. Río Senguerr, Mallín de Vera, Estación Zootécnica río Mayo, 28.1.1954, *Soriano 4514* (BAA) – Depto. Río Senguerr, 55 km al N del río Mayo a Alto Río Senguerr, ruta 40, 30.1.1967, *Boelcke et al. 12975* (BAA, SI, SP). – Prov. Río Negro: Depto. Pilcaniyeu, Estancia Rayhuao, 21.1.1966, *Vallerini 672* (BAA).

Esta especie puede ser confundida con *R. lechleri*. Ambas son de pequeño tamaño y presentan 2 hileras bien definidas de fascículos en el dorso de la lema. Sin embargo, el ápice de la pálea agudo y alargado, las glumas café verdosas y la mayor densidad de pelos en los fascículos de la lema permiten diferenciarlas claramente.

6. ***Rytidosperma violaceum*** (E.Desv.) Nicora, Darwiniana 18: 91. 1973 ≡ *Danthonia violacea* E.Desv., in Gay, Fl. Chil. 6: 365, lám. 80. 1854. **Holotypus**: Chile. *Gay* (P; BAA, SGO!: fragm.) ≡ *Notodanthonia violacea* (E. Desv.) Veldk., Taxon 29: 297. 1980.

Icones: DERTSCHENY 1989; GAY 1854, lám. 80, fig. 1; NICORA 1973, fig. 3 (f–k); NICORA 1978, fig. 16.
Fig. 12: A–C

Cañas floríferas 2–4(–6)-nodes, de (7–)10–62 cm de altura. Innovaciones intra o extravaginales. Hojas basales de hasta 20 cm de largo, pilosas, raro glabras. Vainas

pilosas, raro glabras, con mechones de pelos de hasta 2(–3) mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,3–1 mm. Láminas pilosas, raro glabras, de hasta 15(–19) cm de largo por 1–3 mm de ancho. Panícula de 2–7 cm de largo, con 4–100 espiguillas. Pedicelos pubescentes, de 0,5–6(–12) mm de longitud. Espiguillas 3–5-floras, sin considerar el último o los dos últimos antecios que son estériles, la terminal de 8–12(–18) mm. Artejos de la raquilla glabros, de 0,5–1 mm. Glumas muy violáceas a verde violáceas, linear-lanceoladas, agudas, 3, 5-nervadas, la inferior de 6,5–15 mm, la superior de 6–15 mm, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 6–11(–13) mm y desde el callo hasta el ápice de la arista dorsal de 8–14,5(–17) mm, callo piloso, de 0,3–0,5(–0,7) mm, pelos de 0,3–1,5 mm, arista dorsal de 6–12(–14,5) mm. Lema pilosa en el dorso, con pelos fasciculados dispuestos en 2 hileras paralelas bien definidas, aunque con una baja densidad de pelos, sobre todo en los inferiores, la superior con 8–10 fascículos, los pelos miden 2,5–4,5 mm, la inferior también con 8–10 fascículos, los pelos miden 0,8–2 mm, siempre hay pelos ralos entre ambas hileras. La lema mide desde su base (sin incluir el callo) hasta la inserción de la arista dorsal 1,8–2,5 mm. Lóbulos laterales de 3,8–9(–10,5) mm, con aristas de 1,5–4(–6) mm. Pálea linear-lanceolada, de 2,8–4(–5) × 0,6–0,9 mm, carinas finamente ciliadas, el dorso con pelos de 0,3–0,8 mm desde la base hasta la zona medial, también con pelos en los bordes, de 0,4–1(–1,3) mm, a menudo ausentes en la madurez, ápice obtuso, truncado, agudo, emarginado, 3-denticulado o levemente 2-denticulado. Lodículas 2, cuneadas, de 0,2–0,5 mm, pilosas, pelos de 0,2–0,8 mm. Estambres 3, anteras de 1–2 mm. Ovario de 0,7–0,9 mm. Estigmas de 1–2 mm. Cariopsis elíptica, café clara, de 1,2–1,8 × 0,6–0,8 mm. Embrión de 0,5–0,8 mm. Hilo de 0,3–0,6 mm. Espiguillas cleistógamas no observadas.
Distribución: Argentina y Chile.
Hábitat: crece en pedregales, suelos volcánicos, entre rocas, en vegas, a altitudes superiores a los 1000 m.

Material citado seleccionado:

Argentina. Prov. Chubut: Lago Futalaufquén, Parque Nacional Los Alerces, 8.3.1952, *Beetle & Bignoli 243* (MO). – Prov. Mendoza: Depto. San Rafael, Alto Valle del Atuel, entre Sominar y Laguna Atuel, 2240–3030 m, 6.–7.2.1955, *Ruiz Leal 16837* (BAA). – Prov. Neuquén: Anfiteatro, Alto Limay, 12.3.1938, *Scott & Biraben 705* (LP) – Cordillera del Viento, 16.1.1935, *Ragonese 103* (BA) – Depto. Catán Lil, Sierra del Chachil, Cajón Chico, 27.1.1965, *Rúgolo & Agrasar 348* (BAA) – Depto. Los Lagos. Isla Victoria, Puesto Mercedes, 18.12.1942, *Diem 466* (BAA, SI, SP) – Depto. Minas, Cajón de Los Chenques, 25.1.1970, *Boelcke et al. 13825* (BAA, MO, SI, SP) – Parque Nacional Nahuelhuapi, Puerto Manzano, 22.12.1962, *Diem 3052* (BAA). – Prov. Río Negro: Depto. Bariloche, Lago Perito Moreno, Cerro Goye, 13.2.1914, *Hosseus 237* (CORD) – Parque Nacional Nahuelhuapi, Ventisquero Frías, 13.1.1952, *Boelcke & Correa 5510* (BAA, SI).

Chile. *Gay s.n.* (SGO). **Región Metropolitana de Santiago**. Prov. Area Metropolitana de Santiago: Cajón de Morales, III.1921, *Jaffuel 222* (CONC) – Cordillera de Las Condes, 1880, *Navarro s.n.* (W) – Entre Lo Valdés y La Yesera, 2450 m, 11.2.1963, *Ricardi, Marticorena & Matthei 869* (CONC). – Prov. Cordillera: San José de Maipo, Cajón del río Morales, 2370 m, 10.1.1989, *Saavedra & Pauchard 2* (CONC). – **V Región**. Prov. Los Andes: Saladillo, vega bajo Hilton, lado estero de Castro, sector mina, 2700 m, 4.1.1991, *Arroyo 91069* (CONC). – Prov. San Felipe de Aconcagua: Cerro Vizcacha, 2100 m, XI.1943, *Boelcke 3278* (SI). – Prov. Valparaíso: Cerro La Campana, 1600 m, 31.3.1931, *Garaventa 2167* (BAA, CONC) – On the Cerro and near the summit of La Campana, 10 miles east of El Granizo, ca. 1800 m, 31.12.1957, *Eyerdam 10118* (NY). – **VI Región**. Prov. Colchagua: río Morinano, Vegas Coloradas, 17.2.1959, *Barrientos 2117* (CONC) – Termas del Flaco, ca. 1700 m, 3.1.1959, *Montero 6049* (CONC). – **VII Región**. Prov. Cauquenes: Hacienda de

Cauquenes, XII.1875, *Dessauer 7092, 7093* (M). – Prov. Curicó: Alrededores de la Laguna de Teno, 2560 m, 29.3.1973, *Marticorena, Matthei & Rodríguez 45* (CONC) – Camino de la Laguna de Teno a la junta con el camino internacional a Paso Vergara, 2350 m, 10.3.1967, *Marticorena & Matthei 959* (CONC) – In Upeo, 7.12.1975, *Zöllner 8446* (MO) – Las Yeguas, 78 km SE de Curicó, 2400 m, 1880, *Borchers s.n.* (GOET) – Potrero Grande, Lomas Blancas, 25.1.1947, *E. Barros 6378, 6380, 6388* (BAA). – Prov. Linares: Cordillera de Linares, II.1888, *R.A. Philippi s.n.* (K, W). – Prov. Talca: Camino de Talca a Paso Pehuenches, 10 km antes del Retén Laguna del Maule, 1750 m, 31.3.1973, *Marticorena, Matthei & Rodríguez 129* (CONC) – Cordillera de Talca, El Picazo, 30.12.1936, *E. Barros 396* (BAA, G). – **VIII Región**. Prov. Biobío: Antuco, frente entrada a Abanico, 10.12.1988, *Baeza 167* (CONC) – Entre canchas de Sky volcán Antuco y refugio Chacay, 29.12.1990, *Baeza 224* (CONC) – Salto del Trubunleo, 23.1.1969, *Boelcke et al. 6556* (BAA). – Prov. Ñuble: Camino a Termas de Chillán, Cueva de los Pincheira, lado este, 23.11.1990, *Baeza 209* (CONC) – Termas de Chillán, sector Aguas Calientes, ca. 1800 m, 7.1.1989, *Baeza 180 b* (CONC). – **IX Región**. Prov. Malleco: Termas río Blanco, 930 m, 1.1.1947, *Pfister s.n.* (CONC).

Especie muy variable en cuanto a sus caracteres biométricos. Las glumas linear-lanceoladas, muy agudas, y de un color violáceo muy intenso, como también la pálea menor de 1 mm de ancho resultan ser caracteres diagnósticos claves para definir esta especie.

7. ***Rytidosperma virescens*** (E.Desv.) Nicora var. ***virescens***, Darwiniana 18: 93. 1973 ≡ *Danthonia virescens* E.Desv., in Gay, Fl. Chil. 6: 363. 1854. **Holotypus**: Chile. *Gay* (P; BAA, SGO!: fragm.) ≡ *Notodanthonia virescens* (E.Desv.) Veldk. var. *virescens*, Taxon 29: 297. 1980.

= *Danthonia andina* Phil., Anales Univ. Chile 94: 33. 1896. Typus: Chile. In Andibus prope thermas Chillanenses inveni pauca specimina, I.1877, *F.Philippi* (BAA: fragm.), *non* Phil., Anales Univ. Chile 94: 30. 1896.

= *Danthonia picta* Nees & Meyen var. *patagonica* Speg., Anales Mus. Nac. Buenos Aires 7: 193. 1902. Holotypus: Argentina. In aridis saxosis inter S. Julian et Rio Deseado, vere 1899, *Ameghino* (LP; Iso: BA!, SI!) ≡ *Rytidosperma virescens* (E.Desv.) Nicora var. *patagonicum* (Speg.) Nicora, Darwiniana 18: 93. 1973 ≡ *Notodanthonia virescens* (E.Desv.) Veldk. var. *patagonica* (Speg.) Veldk., Taxon 29: 297. 1980.

= *Danthonia werdermanni* Pilger, Notizbl. Bot. Gart. Berlin-Dahlem 10: 758. 1929. Holotypus: Chile. Prov. Cautín, Volcán Llaima, häufig auf Lavafeldern in Waldlichtungen, ca. 1000 m, II.1927, *Werdermann 1251* (B!; Iso: CONC!, G!, M!, MO!, S!).

Icones: DERTSCHENY 1989; NICORA 1973, fig. 4 (a–e); NICORA 1978, fig. 18; NICORA & RÚGOLO 1987, fig. 29.
Fig. 12: D–G

Cañas floríferas 1–4-nodes, de 4–52 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 22(–35) cm de largo, pilosas, raro glabras. Vainas glabras, con mechones de pelos de hasta 3,5 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,4–1(–1,5) mm. Láminas pilosas, raro glabras, de hasta 15,5(–19) cm de largo por 1,2–2,5 mm de ancho. Panícula de (1,4–) 2–8 cm de largo, con 1–15(–22) espiguillas. Pedicelos pubescentes, de 0,5–12 mm de longitud. Espiguillas (2–)3–5-floras, sin considerar el último antecio estéril, la terminal de 12–20,5 mm. Artejos de la raquilla glabros, de 0,5–1 mm. Glumas violáceas a café verdosas, lanceoladas, la inferior de (7–)9–18 mm, 5, 7-nervada, la superior de (7–)9–17 mm, 3, 5, 7-nervada, mayores

que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 9–14 (–15) mm y desde el callo hasta el ápice de la arista dorsal de (10,8–) 11,5–17(–19) mm, callo piloso, de 0,4–0,8 mm, pelos de 0,3–1,5(–2) mm, arista dorsal de 7,5–15 mm de longitud. Lema pilosa en el dorso, con pelos fasciculados dispuestos en 2 hileras paralelas bien definidas y con una alta densidad de pelos, la superior con 9–10 fascículos, los pelos miden 4–6(–7) mm, la inferior con 8–10 fascículos, los pelos miden 1,5–3 mm, a veces hay pelos ralos entre ambas hileras. La lema mide desde su base (sin incluir el callo) hasta la inserción de la arista dorsal (2,5–)3–3,5(–3,8) mm. Lóbulos laterales de 5,5–10(–11,5) mm, con aristas de 2–5(–5,8) mm. Pálea lanceolada, de (4–)4,7–6,5 × 1–1,7 mm, carinas finamente ciliadas, el dorso con pelos ralos de 0,2–0,5 mm, o glabro en la madurez, los bordes con abundantes pelos, de 0,5–2,5 mm, ápice 2–3-denticulado. Lodículas 2, cuneadas, de 0,3–0,6 mm, pilosas, pelos de 0,2–1 mm. Estambres 3, anteras de 1–2 mm. Ovario de 0,8–1,3 mm. Estigmas de 1,5–2,5 mm. Cariopsis elíptica, café clara, de 1,7–2,6 × 0,8–1,3 mm. Embrión de 0,9–1,5 mm. Hilo de 0,5–1 mm. Espiguillas cleistógamas no observadas.
Distribución: Argentina y Chile.
Hábitat: crece en suelos humíferos de elementos finos, entre lajas, en mallines, en escoria volcánica, en suelos arenosos, en estepas, en lugares húmedos, en suelos erosionados, a orillas de arroyos de deshielo, a altitudes superiores a los 1000 m en la Cordillera de los Andes.

Material citado seleccionado:

Argentina. Prov. Chubut: Depto. Cushamen, 31.12.1947, *Soriano 2783* (BAA) – Depto. Tehuelches, camino a lago Vintter, 20 km del río Pico, 16.1.1948, *Krapovickas 4126* (BAA) – Estancia Pampa Chica, Cerro Cuche, 28.1.1947, *Soriano 2522* (BAA) – Parque Nacional Los Alerces, Lago Futalaufquén, orilla este, 18.2.1950, *Soriano 4174* (BAA) – Pampa del Castillo, 6.2.1932, *Castellanos s.n.* (BA). – Prov. Mendoza: Depto. Malargüe, Paso Pehuenche, sobre el límite con Chile, 2400 m, 30.1.1963, *Boelcke, Bacigalupo & Correa 10387* (BAA, SI) – Depto. San Rafael, Atuel Valley near Campamento Atuel, 2400 m, 26.12.1955, *Böcher, Hjerting & Rahn 1513* (C) – Las Cuevas, Hautis Cordilleres de Mendoza, 3000 m, *Pennington 11* (BR) – San Carlos, Laguna Diamante, ribera oeste, 3320 m, 18.1.1963, *Boelcke, Bacigalupo & Correa 10034* (BAA, SI). – Prov. Neuquén: Depto. Catan Lil, Sierra del Chachil, 2000 m, 30.1.1965, *Rúgolo & Agrasar 457* (BAA) – Depto. Chos Malal, Cajón inferior del Arroyo Turbio, 2300 m, 28.1.1964, *Boelcke et al. 11328* (BAA, M, SI) – Depto. Lácar, Cerro Chapelco, 27.1.1969, *Boelcke et al. 6622* (BAA, MO) – Depto. Loncopué, Cajón Chenque Pehuén, 14.1.1965, *Rúgolo & Agrasar 123* (BAA) – Depto. los Lagos, Estancia Fortín Chacabuco, 24.1.1960, *Boelcke 10490* (BAA) – Depto. Minas, lagunas Epu-Lauquén, orilla norte, 1300 m, 16.1.1964, *Boelcke, Correa, Bacigalupo et al. 10894* (BAA, SI) – Depto. Ñorquín, Copahue, 1900 m, 11.1.1965, *Calderón & Rúgolo 66* (BAA) – Depto. Picunches, Andes de Neuquén, Pino Hachado, 1800 m, II.1920, *Hauman s.n.* (BR) – Entre Junín de los Andes y Huechahue, 17.12.1952, *Cabrera 11303* (BAA) – Lago Quillén, Estancia La Ofelia, 20.1.1948, *Dawson & Schwabe 2851* (BAA) – Laguna Malvarco Tapia, 23.1.1935, *Ragonese 271* (BA) – Quetrihué, Nahuelhuapi, 15.12.1940, *Diem 287* (SI, SP). – Prov. Río Negro: Depto. Bariloche, Cerro López, 1200 m, 30.1.1934, *Parodi 11519* (BAA, MO) – Depto. Güer Aike, Ruta 293, 43 km al W de río Gallegos, 14.1.1967, *Boelcke et al. 12375* (MO) – Depto. Lago Argentino, brazo norte, 19.1.1967, *Boelcke et al. 12542* (BAA, MO) – Lago Frías, picada al Ventisquero Frías, 31.1.1941, *Perez Moreau s.n.* (BA) – Lago Guillermo, 12.2.1938, *Castellanos s.n.* (BA) – Parque Nacional Nahuelhuapi, valle del río Alerce, ca. 920 m, *Boelcke 2059* (BAA) – Perito Moreno, Estancia San Ramón, potrero Chilotes, 14.12.1962, *Vallerini 274* (BAA, SI). – Prov. Santa Cruz: Depto. Deseado, San Julián, río Deseado, 1899, *Ameghino s.n.* (BA, SI) – Depto. Güer Aike, Estancia Cabo Buen Tiempo, 4.12.1975, *T.B.P.A. 62* (HIP) – Depto. Lago Argentino, Lago Argentino, brazo norte, brazo del

Ventisquero Upsala, 19.1.1967, *Boelcke et al. 12542* (BAA, SI) – Depto. río Chico, Lago Pueyrredón, río Oro, camino a estancia río Oro, 480–500 m, 27.1.1967, *Boelcke et al. 12890* (BAA, SI). – Prov. Tierra del Fuego: Depto. San Sebastián, Estancia María Behety, río Grande, 28.1.1955, *Soriano 4881* (BAA) – Castillo, Cerro de Piedra, 14.1.1933, *Castellanos 7604* (BA, BAA) – Entre Estación Viamonte y río Grande, 11.1.1933, *Castellanos s.n.* (BA) – Estancia Los Flamencos, 46 km W of río Grande, 4.1.1972, *Moore & Goodall 307* (SI).

Chile. Chile. *Gay s.n.* (SGO!). – **IV Región**. Prov. Elqui: Coquimbo, *Reiche s.n.* (W). – **Región Metropolitana de Santiago**. Prov. Area Metropolitana de Santiago: Camino de Santiago a Mina La Disputada, 5 km antes de Pérez Caldera, 2400 m, 17.1.1964, *Marticorena & Matthei 697* (CONC) – La Parva, 2800 m, 25.1.1981, *Alliende 22* (CONC) – Quebrada el Yeso, 2500 m, 28.1.1986, *Araya 37* (CONC). – **VI Región**. Prov. Colchagua: El Flaco, 7.2.1953, *E. Barros 10021* (BAA). – **VII Región**. Prov. Talca: Cuesta Los Cóndores, valle del río Maule, 1500–2050 m, 31.1.1994, *Villagrán 8283* (CONC) – Entre Tranque del Maule y la bocatoma del canal, 560 m, 14.2.1963, *Ricardi, Marticorena & Matthei 1001* (CONC). – **VIII Región**. Prov. Biobío: Laguna del Laja, sector Las Lagartijas, 1380 m, 29.12.1990, *Baeza 219 a* (CONC). – Prov. Ñuble: Termas de Chillán, *F. Philippi s.n.* (W). – **IX Región**. Prov. Cautín: Volcán Llaima, ca. 1000 m, II.1927, *Werdermann 1251* (B, CONC, G, M, MO, S). – Prov. Malleco: Camino a Paso Pino Hachado, Lonquimay, 1750 m, 10.1.1948, *Pfister s.n.* (CONC) – Camino de las Termas de Manzanares a Lonquimay, km 29, 990 m, 9.2.1960, *Ricardi & Marticorena 5019/1403* (BAA, CONC) – Laguna Conguillio, 11.2.1971, *Zöllner 4822* (CONC). – **X Región**. Prov. Osorno: Antillanca, ca. 1000 m, 12.2.1967, *Bleiholder s.n.* (CONC). – **XI Región**. Prov. Aisén: río Cisnes, 14.2.1962, *Ricardi & Matthei 517* (BAA, CONC). – Prov. Coihaique: About 10 km of El Blanco, 5.2.1986, *Pedersen 14372* (C, MO) – Ca. 6 km west of Villa Cerro Castillo, ca. 400 m, 6.1.1988, *Povilitis & Braynshaw 87-293* (HIP). – **XII Región**. Prov. Magallanes: Camino Punta Arenas-Puerto Natales, Estación Experimental Kampenaike (INIA), 20 m, 22.1.1988, *Matthei & Rodríguez 584* (CONC) – río Verde, a 150 km del Estrecho de Magallanes, II.1927, *Guiñazu 121* (BAA). – Prov. Tierra del Fuego: Cullén, 3.1.1962, *Ricardi & Matthei 255* (BAA, CONC). – Prov. Ultima Esperanza: Cerro Donoso, sector río de Las Chinas, 700 m, 9.–11.2.1987, *Arroyo, Veloso & Peñaloza 870232* (CONC) – Cordillera de Paine, 750–1000 m, 14.2.1992, *Von Bohlen & Cavieres 92-303* (CONC) – Cueva del Milodón, 100 m, 5.2.1962, *Ricardi & Matthei 373* (BAA, CONC) – Morro Chico, 14.2.1955, *Magens 3036* (HIP) – Parque Nacional Torres del Paine, río Grey, 7.1.1988, *Dollenz 1416* (CONC) – Puesto Weber, Estancia Payne, 20.2.1974, *Pisano 4295* (HIP) – Sierra de Los Baguales, entre Cerro Santa Lucía y confluencia ríos Baguales y Bandurrias, 26.1.1985, *Arroyo 850126* (CONC, HIP).

Especie variable en cuanto al tamaño del escapo floral. NICORA (1973) reconoce la variedad *patagonica*, en base al carácter coriáceo de la pálea. Sin embargo, este carácter aparece también en la variedad típica, al menos en las plantas chilenas. No se encontraron otros caracteres para definir esta variedad, de manera tal que se sinonimiza a la variedad típica.

8. ***Rytidosperma virescens*** (E.Desv.) Nicora var. ***parvispiculum*** Nicora, Darwiniana 18: 95. 1973. **Holotypus**: Argentina. Santa Cruz, Depto. Lago Argentino, El Calafate a Lago Viedma, *Boelcke 12632* (BAA; Iso: SI!) ≡ *Notodanthonia virescens* (E. Desv.) Veldk. var. *parvispicula* (Nicora) Veldk., Taxon 29: 297. 1980.

Icon: NICORA 1973, fig. 4 (f).
Fig.12: H

Cañas floríferas 1–3-nodes, de 5–22 cm de altura. Innovaciones intravaginales. Hojas basales de hasta 10 cm de largo, pilosas. Vainas pilosas a pilosas ralas, con me-

chones de pelos de hasta 3 mm a ambos costados de la lígula. Lígula pestañosa, con pelos de 0,5–2,5 mm. Láminas pilosas, de hasta 7 cm de largo por 1,2–2 mm de ancho. Panícula de 1,5–3,8 cm de largo, con 2–7 espiguillas. Pedicelos pilosos, de 0,5–7 mm de longitud. Espiguillas 3–5-floras, sin considerar el último antecio estéril, la terminal de 11–16 mm. Artejos de la raquilla glabros, de 0,5–1,2 mm. Glumas café verdosas a violáceas, lanceoladas, la inferior de 9–14,5 mm, 5, 7-nervada, la superior de 9–14 mm, 5-nervada, mayores que el conjunto de los antecios. Antecio inferior desde el callo hasta las aristas de los lóbulos de 7,5–10,5 mm y desde el callo hasta el ápice de la arista dorsal de 9–14 mm, callo piloso, de 0,4–0,8 mm, pelos de 0,5–1(–1,5) mm, arista dorsal de 6–10 mm de longitud. Lema pilosa en el dorso, con pelos fasciculados dispuestos en 2 hileras paralelas bien definidas y con una alta densidad de pelos, ambas con 10 fascículos, los pelos de la hilera superior miden 3–4,5 mm, y los de la inferior 1,5–2,5 mm, a veces hay pelos ralos entre ambas hileras. La lema mide desde su base (sin incluir el callo) hasta el nacimiento de la arista dorsal 3–3,5 mm. Lóbulos laterales de 4,5–6,5 mm, con aristas de 1,8–3,2 mm. Pálea lanceolada, de 4,7–6 × 1,1–1,4 mm, carinas finamente ciliadas, el dorso con pelos ralos de 0,3–0,5 mm, o glabro en la madurez, los bordes con abundantes pelos, de 0,5–2 mm, ápice obtuso a subtridenticulado. Lodículas 2, cuneadas, de 0,4–0,6 mm, muy pilosas, pelos de 0,3–1,1 mm. Estambres 3, anteras de 1,2–1,8 mm. Ovario de 0,9–1 mm. Estigmas de 2–2,2 mm. Cariopsis elíptica, café clara, de 2–2,2 × 0,9–1,1 mm. Embrión de 1–1,4 mm. Hilo de 0,5–0,6 mm. Espiguillas cleistógamas no observadas.
Distribución: variedad endémica de Argentina.
Hábitat: crece en lugares secos, entre rocas y conglomerados, en suelos arenosos orgánicos, en sedimentos glacifluviales.

Material citado seleccionado:

Argentina. Prov. Neuquén: Depto. Los Lagos, Isla Victoria, 800 m, 24.11.1940, *Diem 284* (BAA) – Depto. Los Lagos, Estancia Fortín Chacabuco, 3.1.1963, *Vallerini 317* (BAA, SI) – Depto. Minas, lagunas Epu-Lauquén, cerro al NW de las lagunas, 1460 m, 17.1.1964, *Boelcke, Correa, Bacigalupo et al. 10954 1/2* (SI, SP). – Prov. Río Negro: Depto. Bariloche, Lago Nahuelhuapi, Cerro Catedral, 1200 m, 8.2.1954, *Parodi 15292* (BAA). – Prov. Santa Cruz: Depto. Deseado, zona de los bosques petrificados en la Gran Altiplanicie Central, 7.12.1965, *Ruiz Leal 24128* (BAA) – Depto. Güer Aike, alrededores de río Gallegos, 22.1.1949, *Soriano 3274* (BAA) – Depto. Lago Argentino, ruta 40, entre El Calafate y Lago Viedma, balsa sobre el río Santa Cruz, 21.1.1967, *Boelcke et al. 12632* (SI!), *12633* (BAA) – Depto. Lago Buenos Aires, 35 km al N de Perito Moreno, 30.1.1967, *Boelcke et al. 12958* (BAA, SI, SP) – Depto. Río Chico, III.1956, *Soriano 5193* (BAA) – río Coyle, Establecimiento Las Vegas, 24.12.1916, *Dauber 190* (BAA). – Prov. Tierra del Fuego: río Grande, II.1962, *Vallerini & Anderson 29* (BAA).

Se diferencia de la variedad típica por presentar el ápice de la pálea obtuso a subtridenticulado. Esta condición de la pálea no se ha encontrado en las plantas chilenas.

Conclusiones y comentarios

Se hace un estudio taxonómico de las especies americanas de los géneros *Danthonia* y *Rytidosperma*. En base a los caracteres morfológicos, y utilizando análisis fenético, se confirma la validez de ambos géneros. Esta aseveración se ve reforzada por los trabajos de NICORA (1973), COPE (1984), TOMLINSON (1985), CLAYTON & RENVOIZE (1986), CONNOR & EDGAR (1979, 1986) y WATSON & DALLWITZ (1992).

Se consideran válidas para el continente americano las siguientes especies de *Danthonia*: *D. annableae* P.M.Peterson & Rúgolo, *D. araucana* Phil., *D. breviseta* Hackel, *D. californica* Boland. var. *californica*, *D. californica* Boland. var. *americana* (Scribner) Hitchc., *D. chaseana* Conert, *D. chiapasensis* Davidse, *D. chilensis* E.Desv. var. *chilensis*, *D. chilensis* E.Desv. var. *aureofulva* (E.Desv.) C.M.Baeza, *D. chilensis* E.Desv. var. *glabriflora* Nicora, *D. cirrata* Hackel & Arechav., *D. compressa* C.Austin, *D. decumbens* (L.) DC., *D. domingensis* Hackel & Pilger subsp. *domingensis*, *D. domingensis* Hackel & Pilger subsp. *obtorta* (Chase ex Hitchc.) Conert, *D. domingensis* Hackel & Pilger subsp. *shrevei* (Britton) Conert, *D.* intermedia Vasey, *D. malacantha* (Steud.) Pilger, *D. melanathera* (Hackel) Bernardello, *D. montevidensis* Hackel & Arechav., *D. parryi* Scribner, *D. rhizomata* Swallen, *D. secundiflora* J.Presl subsp. *secundiflora*, *D. secundiflora* J.Presl subsp. *charruana* (Swallen) Roseng., Arrill. & Izag., *D. secundiflora* J.Presl subsp. *mattheii* C.M.Baeza, *D. sericea* Nutt., *D. spicata* (L.) P.Beauv. ex Roemer & Schultes y *D. unispicata* (Thurb.) Munro ex Macoun.

Se crea la siguiente subespecie: *D. secundiflora* J.Presl subsp. *mattheii* C.M.Baeza, y se hace la nueva combinación *D. chilensis* E.Desv. var. *aureofulva* (E.Desv.) C.M.Baeza.

El género *Danthonia* se distribuye en todo el continente americano, desde Alaska hasta la Provincia de Chiloé en Chile, ocupando una amplia diversidad de hábitats. El rango altitudinal que ocupa es bastante variable, sobre todo en América del Norte y Central. En Chile y Argentina se distribuye desde prácticamente el nivel del mar hasta altitudes de aproximadamente 1000 m.

Los planteamientos propuestos por DOBRENZ & BEETLE (1966) se ven apoyados con este estudio, puesto que están confirmando la mayoría de sus postulados.

El género *Rytidosperma* esta representado en el continente americano por las especies: *R. lechleri* Steud., *R.* paschale (Pilger) C.M.Baeza, *R. pictum* (Nees & Meyen) var. *pictum*, *R. pictum* (Nees & Meyen) var. *bimucronatum* Nicora, *R. sorianoi* Nicora, *R. violaceum* (E.Desv.) Nicora, *R. virescens* (E.Desv.) Nicora var. *virescens* y *R. virescens* (E.Desv.) Nicora var. *parvispiculum* Nicora.

Rytidosperma, al igual que Danthonia, tuvo su origen en el continente de Gondwana. Esto se explica por el gran número de especies en América del Sur, Australia y Nueva Zelandia. En Sudamérica, la migración del género *Rytidosperma* ocurrió sólo hasta la Provincia de Elqui, Chile. Las especies crecen solamente en la Cordillera chilena de Nahuelbuta, y a lo largo de la Cordillera de los Andes en Argentina y Chile, siempre sobre los 1000 m de altitud, a excepción de las especies patagónicas.

La morfología de la lema es el carácter más importante para diferenciar los géneros y las especies. Esto ya había sido señalado por VICKERY (1956) para las especies australianas de *Danthonia*.

El análisis fenético resulta ser una herramienta útil, sobre todo para separar *Danthonia* de *Rytidosperma*. Dentro de cada género, la situación tiende a ser no tan clara, debido a que los caracteres biométricos son bastante variables y muchas veces se sobreponen entre las especies.

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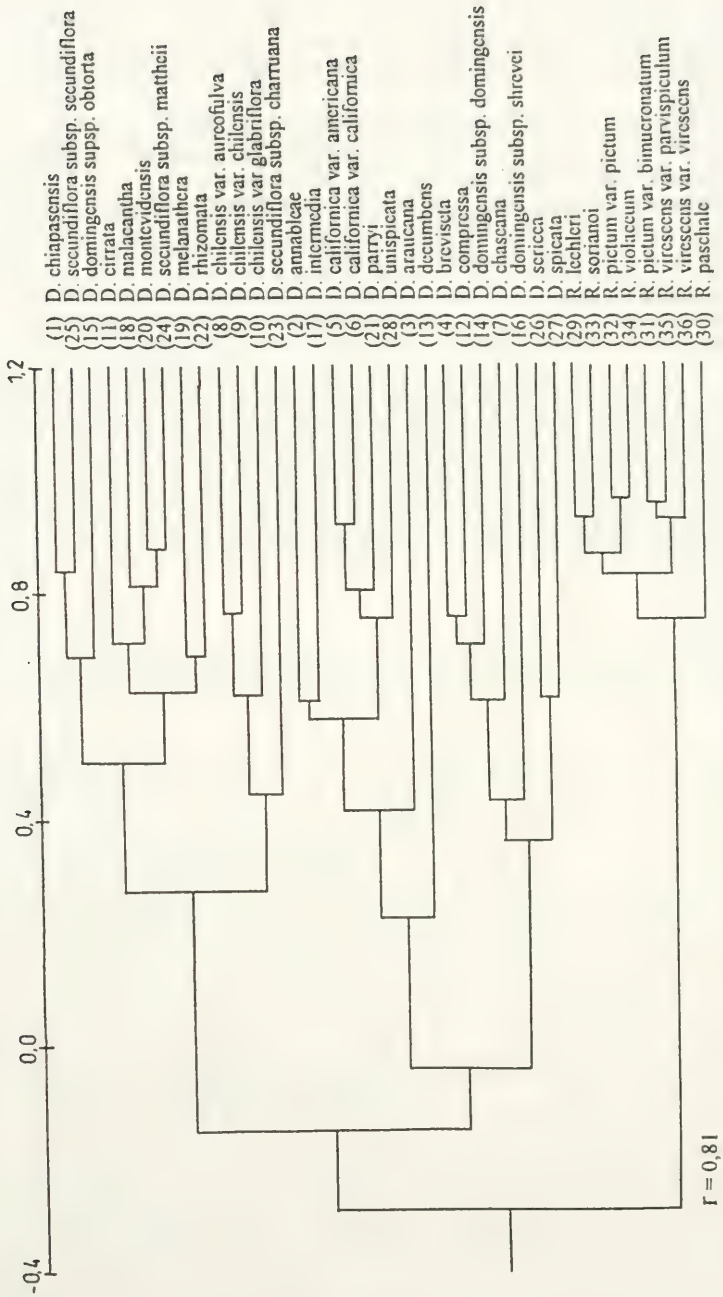

Fig. 1: Dendrograma generado vía CORR y ligamiento UPGMA para *Danthonia* y *Rytidosperma*.

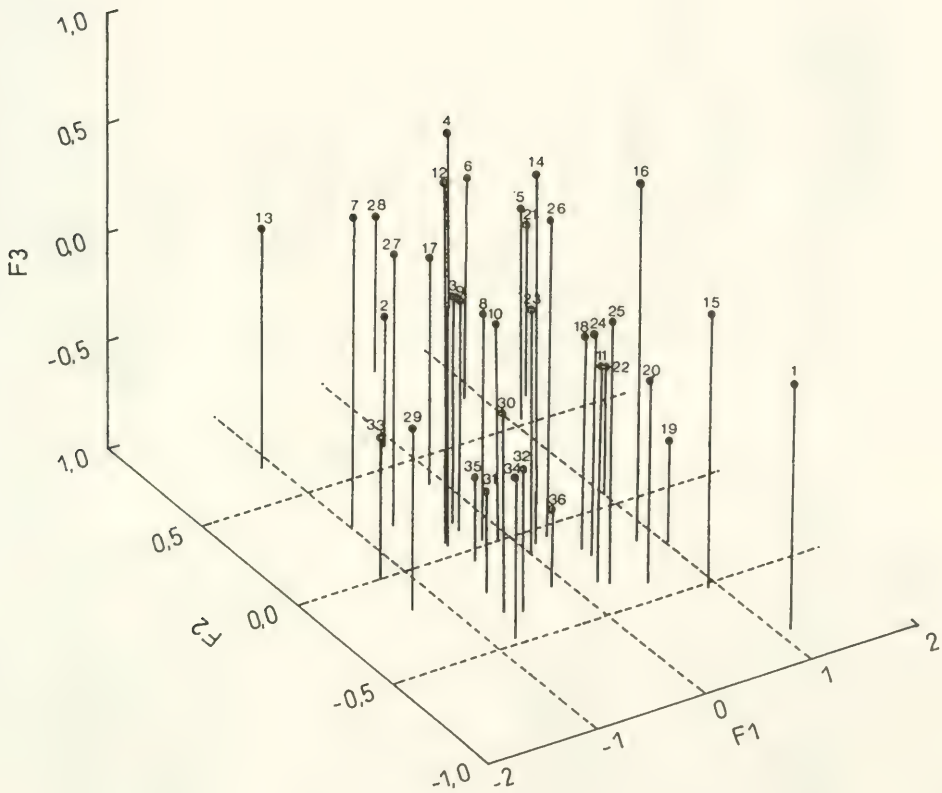

Fig. 2: Análisis de componentes principales (PCA) para *Danthonia* y *Rytidosperma.*

Fig. 3: A–C: *D. intermedia*: A: Panícula – B: Lema – C: Pálea (*Keck 4599*, C); D–E: *D. decumbens*: D: Lema – E: Pálea (*Pohl 14079*, K); F–H: D. californica var. californica: F: Panícula – G: Lema – H: Pálea (*Hoffman 2045*, B); I: D. californica var. americana: Vaina (*Matthei & Bustos 22*, CONC).

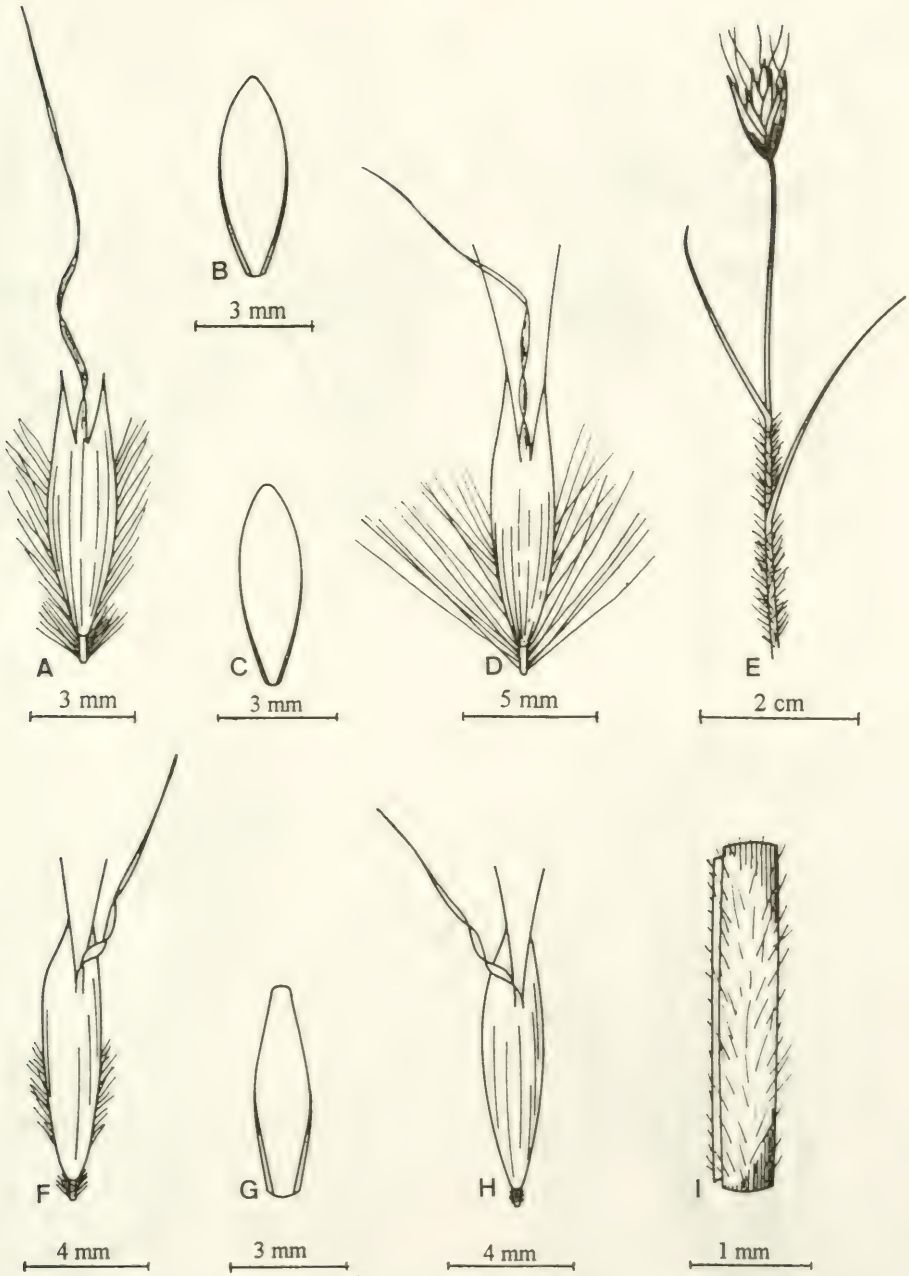

Fig. 4: A–B: D. *secundiflora subsp. charruana*: A: Lema – B: Pálea (*Castellanos 22670*, COL); C–D: *D. secundiflora subsp. secundiflora*: C: Pálea – D: Lema (*Cabrera 12301*, LP); E: *D. unispicata*: Panícula (*Howell 26092*, G); F–G: *D. chilensis var. chilensis*: F: Lema – G: Pálea (*Baeza 227*, CONC); H: *D. chilensis var. glabriflora*: Lema (*Pfister 6283*, CONC); I: *D. chilensis var. aureofulva*: Vaina (*Lammers et al. 7932*, CONC).

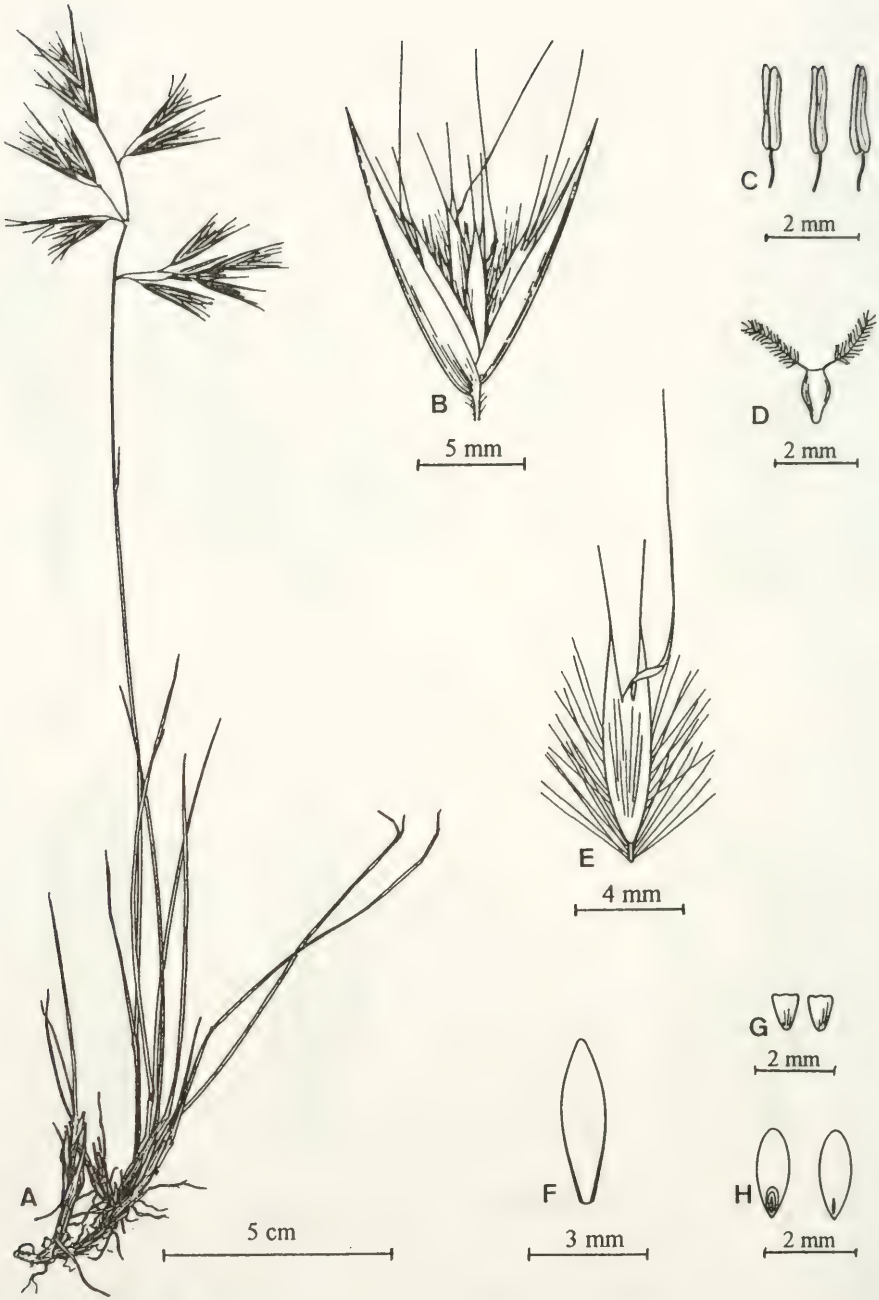

Fig. 5: *D. secundiflora subsp. mattheii*: A: Hábito – B: Espiguilla terminal – C: Estambres – D: Ovario con estigmas – E: Lema – F: Pálea – G: Lodículas – H: Cariopsis (*Kummrow 2423*, G).

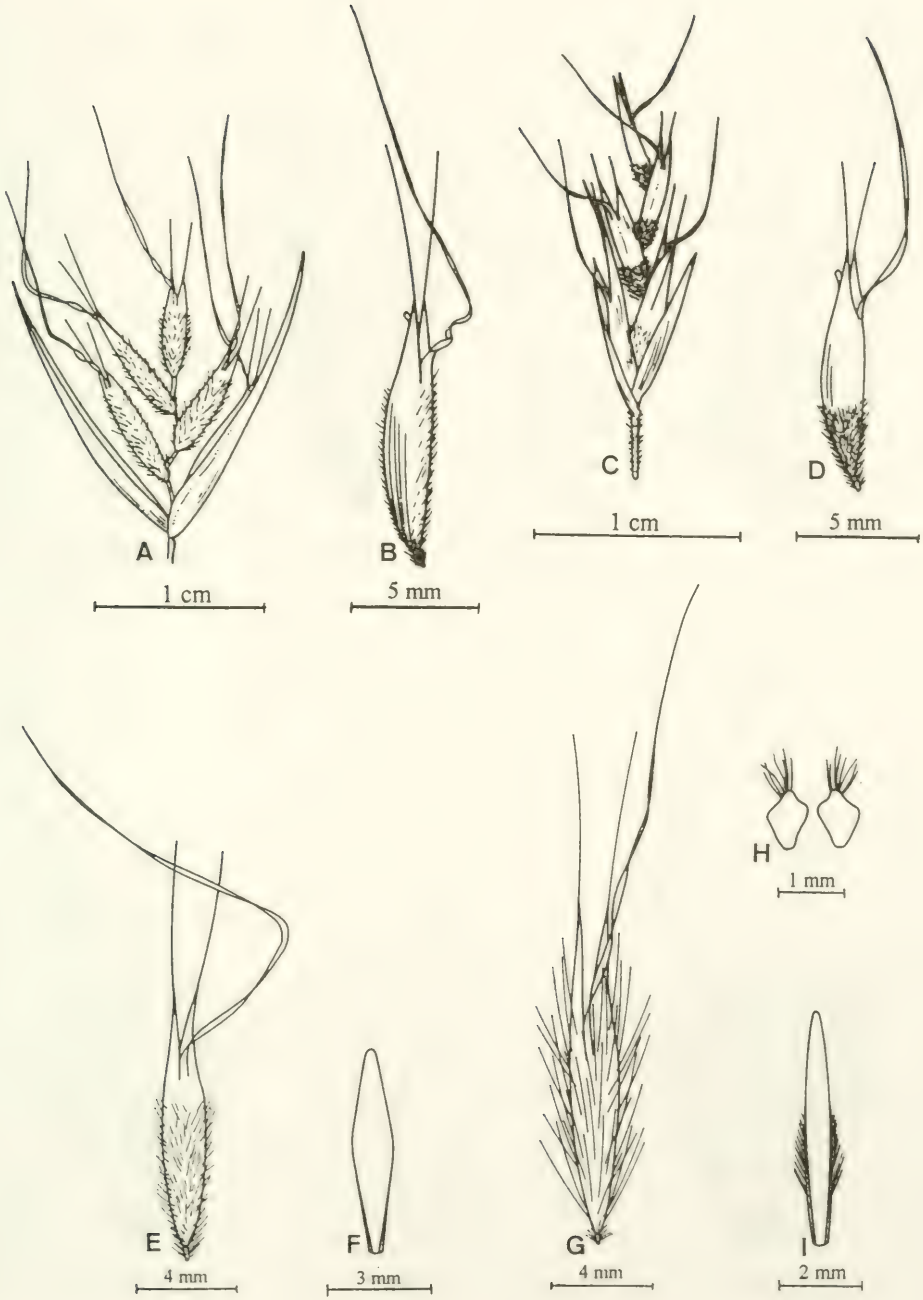

Fig. 6: A–B: *D. domingensis subsp. obtorta*: A: Espiguilla terminal – B: Lema (*Ekman 13748*, S); C–D: *D. domingensis subsp. domingensis*: C: Espiguilla terminal – D: Lema (*Ekman 13659*, S); E–F: *D. domingensis subsp. shrevei*: E: Lema – F: Pálea (*Harris 11629*, S); G–I: *D. chiapasensis*: G: Lema – H: Lodículas – I: Pálea (*Breedlove & Thorne* 30108, DS).

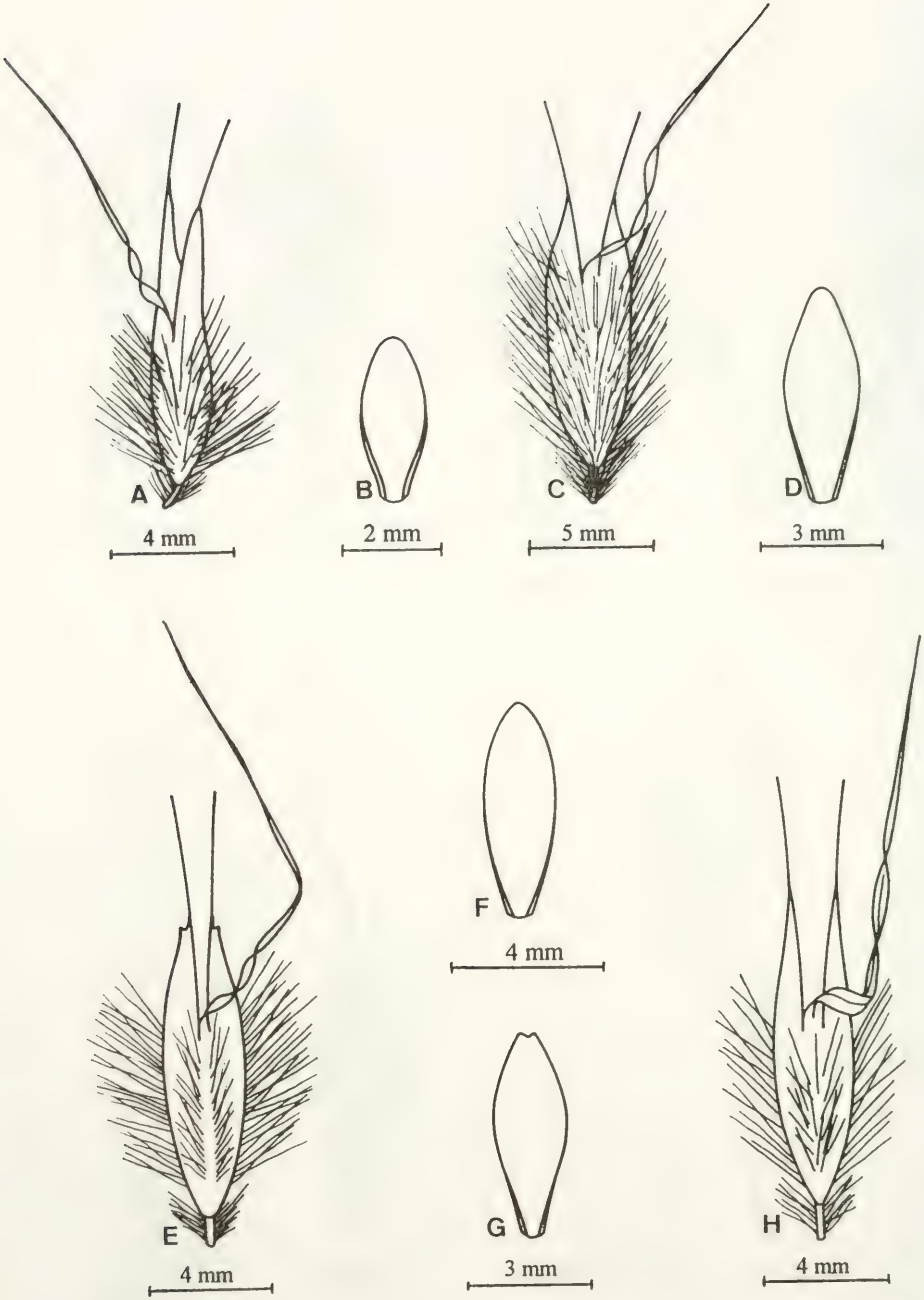

Fig. 7: A–B: *D. cirrata*: A: Lema – B: Pálea (*Nicora 6948*, BAA); C–D: *D. malacantha*: C: Lema – D: Pálea (*Baeza 163*, CONC); E–F: *D. montevidensis*: E: Lema – F: Pálea (*Cabrera 481*, SP); G–H: *D. melanathera*: G: Pálea – H: Lema (*Estrada 16810*, W).

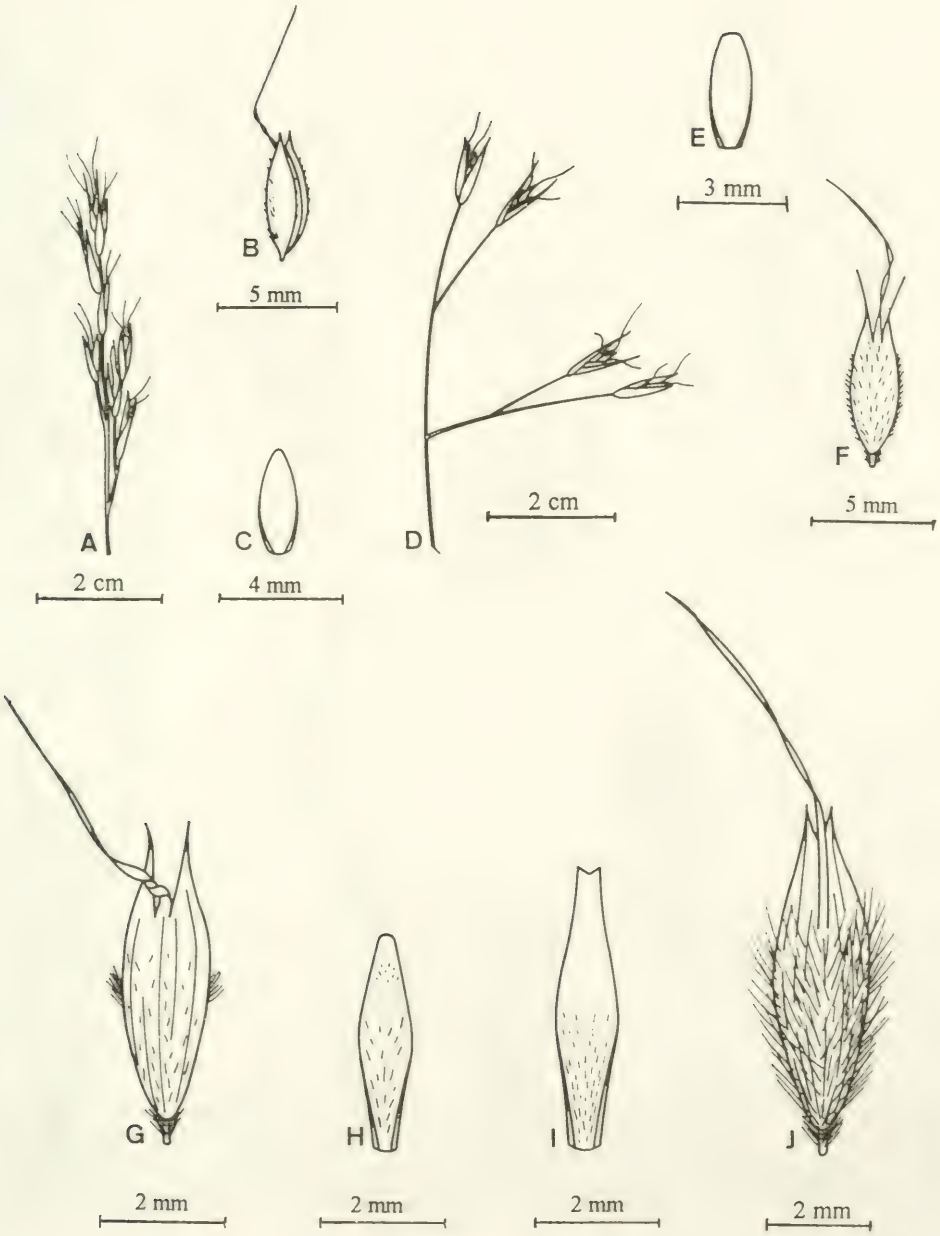

Fig. 8: A–C: *D. spicata*: A: Panícula – B: Lema – C: Pálea (*Taylor et al. 883*, S); D–F: *D. compressa*: D: Panícula – E: Pálea – F: Lema (*Fernald s.n.*, BM); G–H: *D. chaseana*: G: Lema – H: Pálea (*A. Chase 9711*, FR); I–J: *D. breviseta*: I: Pálea – J: Lema (*Glaziou 17361*, C).

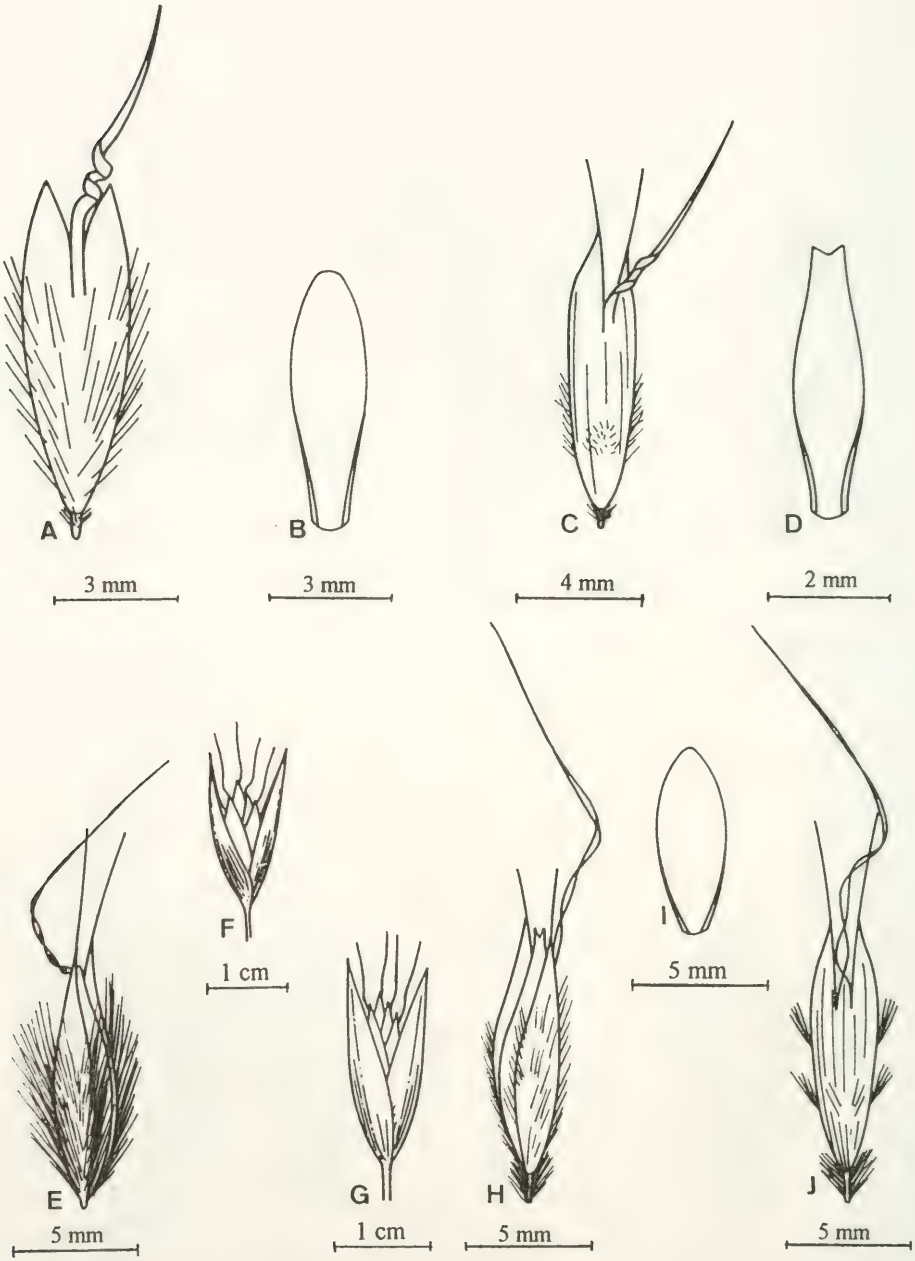

Fig. 9: A–B: *D. annableae*: A: Lema – B: Pálea (*Renvoize et al. 5303*, K); C–D: *D. araucana*: C: Lema – D: Pálea (*Baeza 159*, CONC); E–F: *D. sericea*: E: Lema – F: Espiguilla terminal (*A. Chase s.n.*, SP); G–H: *D. parryi*: G: Espiguilla terminal – H: Lema (*Hartman 2616*, C); I–J: *D. rhizomata*: I: Pálea – J: Lema (*Rosengurtt B–5320*, LP).

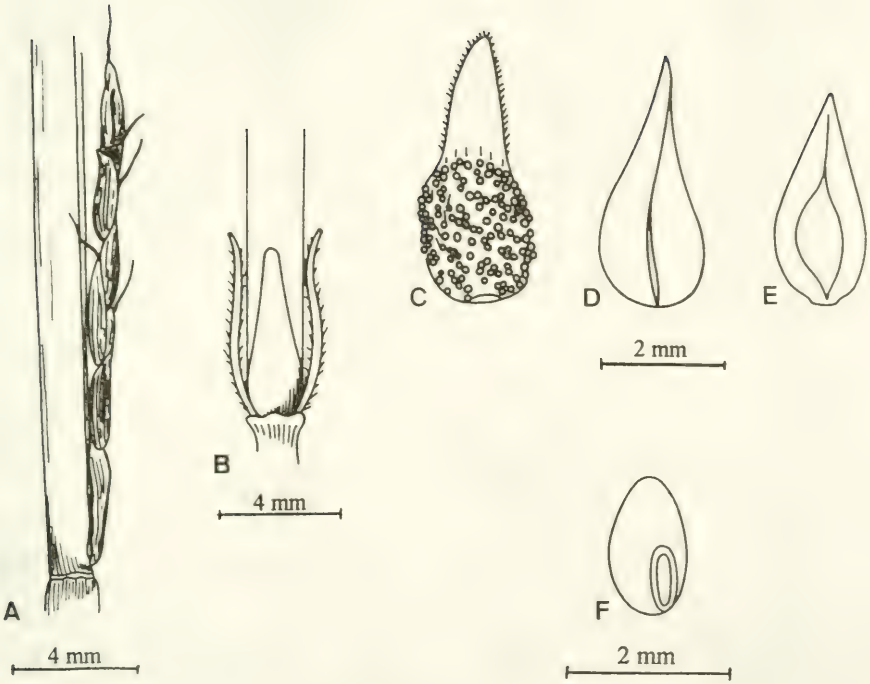

Fig. 10: A–B: *D. compressa*: A: Espiguilla cleistógama axilar pluriflora – B: Espiguilla cleistógama axilar uniflora (*Fernald s.n.*, BM); C–F: *D. chilensis var. glabriflora*: C: Profilo externo de una espiguilla cleistógama basal – D: Lema cleistógama basal – E: Pálea cleistógama basal – F: Cariopsis cleistógama basal (*Pfister 6283*, CONC).

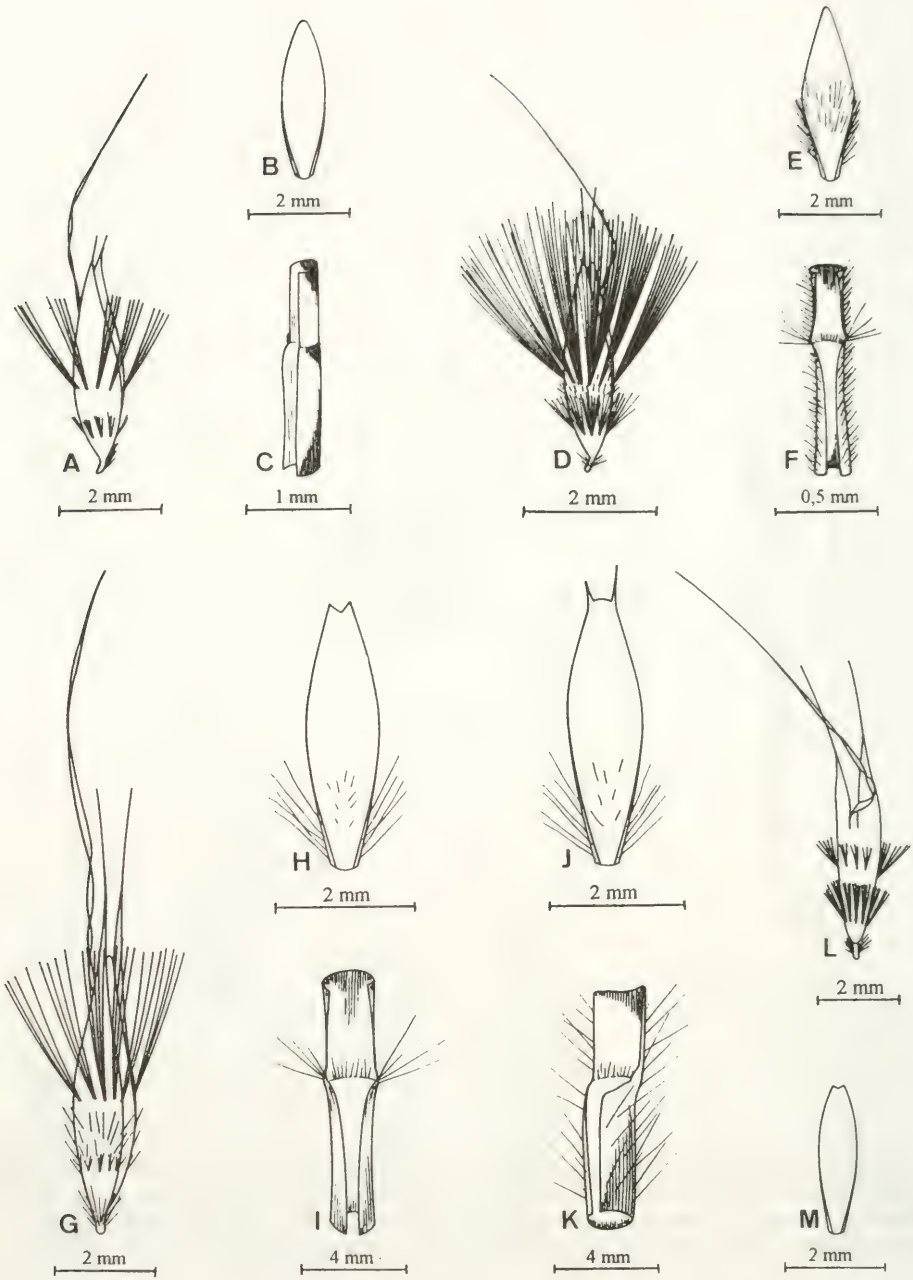

Fig. 11: A–C: *R. lechleri*: A: Lema – B: Pálea – C: Vaina (*Baeza 218*, CONC); D–F: *R. sorianoi*: D: Lema – E: Pálea – F: Vaina (*Soriano 2419*, SI); G–I: *R. pictum var. pictum*: G: Lema – H: Pálea – I: Vaina (*Baeza 223*, CONC); J–K: *R. pictum var. bimucronatum*: J: Pálea – K: Vaina (*León & Calderón 876*, BAA); L–M: *R. paschale*: L: Lema – M: Pálea (*Etienne s.n.*, CONC).

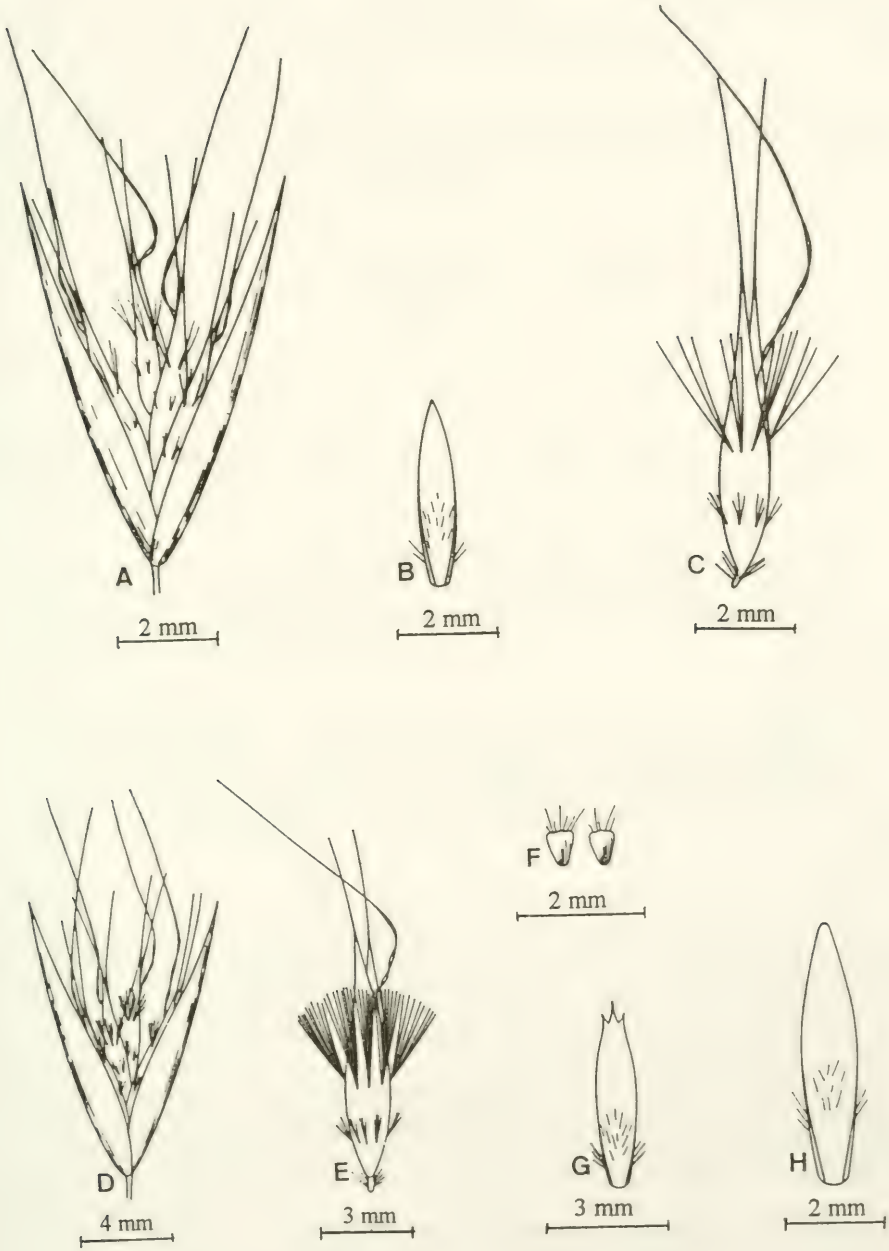

Fig. 12: A–C: *R. violaceum*: A: Espiguilla terminal – B: Pálea – C: Lema (*Marticorena & Matthei 959*, CONC); D–G: *R. virescens var. virescens*: D: Espiguilla terminal – E: Lema – F: Lodículas – G: Pálea (*Araya 37*, CONC); H: *R. virescens var. parvispiculum*: Pálea (*Vallerini & Anderson 29*, BAA).

A new species of Allium sect. Codonoprasum from Sierra Nevada (Spain)

S. BRULLO, P. PAVONE & C. SALMERI

Abstract:
BRULLO, S., PAVONE, P. & SALMERI, C.: A new species of Allium sect. Codonoprasum from Sierra Nevada (Spain). – Sendtnera 3: 95–100. 1996. – ISSN 0944–0178.

A new species of *Allium* sect. *Codonoprasum*, *Allium valdesianum*, is described and illustrated. *A. valdesianum* occurs in the alpine belt of the Sierra Nevada, S Spain and grows there on rocky pastures. Its karyology, leaf anatomy and taxonomical relationships are discussed.

Zusammenfassung:
Eine neue Art von *Allium* sect. *Codonoprasum*, *Allium valdesianum* wird beschrieben und illustriert. *A. valdesianum* kommt in der alpinen Zone der Sierra Nevada, Südspanien vor und besiedelt dort Felsfluren. Seine Karyologie, Blattanatomy und taxonomischen Beziehungen werden diskutiert.

Introduction

In the frame of a cytotaxonomical research on the *Allium paniculatum* group, an orophilous population coming from Sierra Nevada (S Spain), occurring on the rocky pastures at about 2500 m, has been examined. According to the literature data (PASTOR & VALDÉS 1983) and herbarium investigations, the specimens of this *Allium* were attributed to *A. paniculatum* L. or to *A. pallens* L. Effectively, it differs substantially from the other Mediterranean populations belonging to the *A. paniculatum* cycle in numerous characters regarding the habit and the flower morphology. In particular, it shows a small size (max. 16 cm high) keeping in the cultivated plants, leaves normally longer than the stem, inflorescence hemispherical, very dense, and short flower pedicels.

Therefore, this *Allium* is proposed as a species new to science and dedicated to Benito Valdés, botanist of Seville University and author of numerous taxonomic contributions to the Iberian flora.

Previously, in a comunication concerning this species (BRULLO et al., 1993), it was named *A. nevadense*, but it is not possible to use the specific epithet "*nevadense*" because another species of *Allium* was already described with this name from N America (REGEL, 1875).

Material and methods

The investigation was based on specimens collected in Sierra Nevada (locus classicus) and cultivated in the Botanical Garden of Catania. In addition to personal collections and field observations a lot of material from various herbaria was examined (CAT, FI, G, M, MA, SEV). For the karyological study, root-tips of bulbs were pretreated with 0,3% colchicine, fixed in Carnoy and stained according to the Feulgen technique. The leaf anatomy was studied on cultivated material, which was fixed in Karpetschenko and embedded in paraffin; the transversal sections were stained with ruthenium red and lightgreen yellowish.

Allium valdesianum Brullo, Pavone & Salmeri, **sp. nov.**

Holotypus: Spagna, Sierra Nevada, presso Albergo Universitario, a c. 2500 m di quota, esemplare coltivato, 28.7.1989, *Brullo s.n.* (CAT; Iso: CAT, FI, M).

Fig. 1

Bulbus ovoideus, 10–12 × 8–10 mm, tunicis externis membranaceis, brunneis, internis hyalinis, albidis. Scapus solitarius, 10–16 cm altus, glaber, teres, erectus, vaginis foliorum per 1/2–1/3 longitudinis tectus. Folia 3–4, glabra, viridia, 6–20 cm longa et 1–2,5 mm lata, costata, semicylindrica, inflorescentia longiora. Spatha bivalvis, persistens, umbella longiora, valvis inaequalibus, longe caudatis, 5-nervatis, liberis, maiore 3–7 cm longa, minore 2–3,5 cm longa. Inflorescentia globosa, densa, multiflora, pedicellis subaequalibus, max. 1 cm longis. Bostryces 12. Perigonium campanulatum, 5–5,5 mm longum, tepalis albo-viridibus, purpura suffusis, venis medianis purpureis, oblongo-ellipticis, ad apicem rotundatis, saepe breviter apiculatis, 2,2–2,5 mm latis. Stamina tepalis breviora, filamentibus simplicibus, albo-purpurescentibus, interioribus 2–2,7 mm longis, exterioribus 1,5–2 mm longis, inferne cum tepalis per 1,5–1,6 mm in annulum connatis, antheris oblongis, albo-luteolis, 1,2–1,3 × 0,6–0,8 mm. Ovarium ellipticum vel elliptico-subcylindricum, papillosum superne, 3,8–4 × 1,5–2 mm. Stylus albus, 0,2–0,4 mm longus. Capsula trivalvis, globoso-obovoidea, 5 × 5 mm.

Bulb ovoid, 10–12 × 8–10 mm, with outer tunics membranaceous, brown, the inner hyaline, whitish. Stem 10–16 cm high, glabrous, erect, cylindric, covered for 1/2–1/3 of its length by the leaf sheaths, often provided with a cluster of leaves in the most inner leaf sheath. Leaves 3–4, glabrous, green, with a linear blade, semicylindrical, 1–2.5 mm wide, 6–20 cm long, ribbed, longer than the inflorescence. Spathe longer than inflorescence, with 2 valves separate, unequal, 5-nerved, with a long appendage, the large 3–7 cm long, the small 2–3.5 cm long. Inflorescence globose, dense, many-flowered, with flowers arranged in 12 bostryces. Pedicels subequal max. 1 cm long. Perigon campanulate, 5–5.5 cm long, with tepals white-greenish tinged with purple, with purplish mid-vein, oblong-elliptical, rounded at the apex, often shortly apiculate, 2.2–2.5 mm wide. Stamens included, with filaments white-purplish, the inners 2–2.7 mm long, the outers 1.5–2 mm long, anthers oblong, white-yellowish, 1.2–1.3 × 0.7–0.8 mm. Ovary elliptical to elliptical-subcylindrical, papillose in the upper part, 3.8–4 × 1.5–2 mm, with style white 0.2–0.4. Capsule trigone, globoso-obovoid, 5 × 5 mm.

Specimens seen:

Spain. Prov. Grenada: Sierra Nevada: *Boissier* (G) – ibid., in Cerro de Los Monjos, *Pau* (MA) – ibid., 11.8.1908, *Pau* (MA) – ibid., region alpines au Peon, 26.7.1851, *Bourgeau*

1495a (FI-W, G, K, P) – ibid., Umgebung des Albergue Universitario, 24.7.1969, *Hertel 10929* (M) – ibid., presso Albergo Universitario, 29.9.1988, *Bartolo & Brullo* (CAT) – ibid., a c. 2500 m di quota, esemplare coltivato, 28.7.1989, *Brullo s.n.* (CAT, FI, M) – ibid., Peon de San Francisco, 21.7.1978, *Pastor* (SEV) – ibid., Veleta, 21.7.1978, *Cabezudo et al.* (SEV) – ibid., Bco. d'Ohanes, cult., 31.7.1927, *Lofthouse* (BM) – ibid., Minas de Beíres, 10.7.1927, *Lofthouse* (BM).

Karyology

A. valdesianum is a diploid species with 2n = 16 (fig. 2). Its chromosome complement is characterized by 7 metacentric pairs (3 of which microsatellited) and 1 submetacentric pair (fig. 3). Consequently, its chromosome formula is:

$$z = 2n = 2x = 16: \ 8\ m + 6\ m^t + 2\ sm.$$

According to literature data and unpublished personal data, this count is very common in numerous diploid populations of the *Allium paniculatum* group; there are, however, some differences in the size and the shape of the chromosomes, which allow to distinguish it well from the other known species belonging to this group (TZANOUDAKIS 1986; TZANOUDAKIS & VOSA 1988; ÖZATHAY 1990, 1993).

Leaf anatomy

The transversal section of the leaf shows an epidermis covered by a thin layer of cuticle with stomata distributed on the whole surface. The one-layered palisade tissue is regular and compact with cylindrical cells, while the sponge tissue is formed by big and vacuolate cells with numerous secretory canals in the periferical part. The number of vascular bundles is 11–12, of which 5–6 are abaxial and 6 adaxial (fig. 4).

Conclusion

Herbarium data and personal field observation show that *A. valdesianum* is localized in the alpine belt above 2400 m on siliceous substrata, where it grows in rocky pastures.

For the occurrence of spathe longer than the inflorescence, simple stamen filaments and ovary with inconspicuous nectaries, *A. valdesianum* belongs to *A.* sect. *Codonoprasum* Reichb. Within this section, *A. valdesianum* is closely related to the taxa of the *A. paniculatum* group, mainly because of the membranaceous bulb-tunics, leaves glabrous and semicylindrical, spathe valves with a long appendage and stamens shorter than the perigon. Besides, due to the small size and the summer flowering period, it shows some resemblance with some orophilous species of the sect. *Codonoprasum*, as *A. parnassicum* (Boiss.) Halacsy from Greece and *A. sibthorpianum* Schultes & Schultes f. from Turkey.

As concerns its origin, *A. valdesianum* arose probably from diploid populations of *A. paniculatum* s. l. in consequence of adaptation to a very cold climate conditions of cryo-mediterranean type, which caused a remarkable delay in the flowering period. On the whole, this species, which can be considered an old taxon, evolved, as the most of the endemics of Sierra Nevada, during the Tertiary for isolation processes mainly of reproductive type.

Acknowledgements

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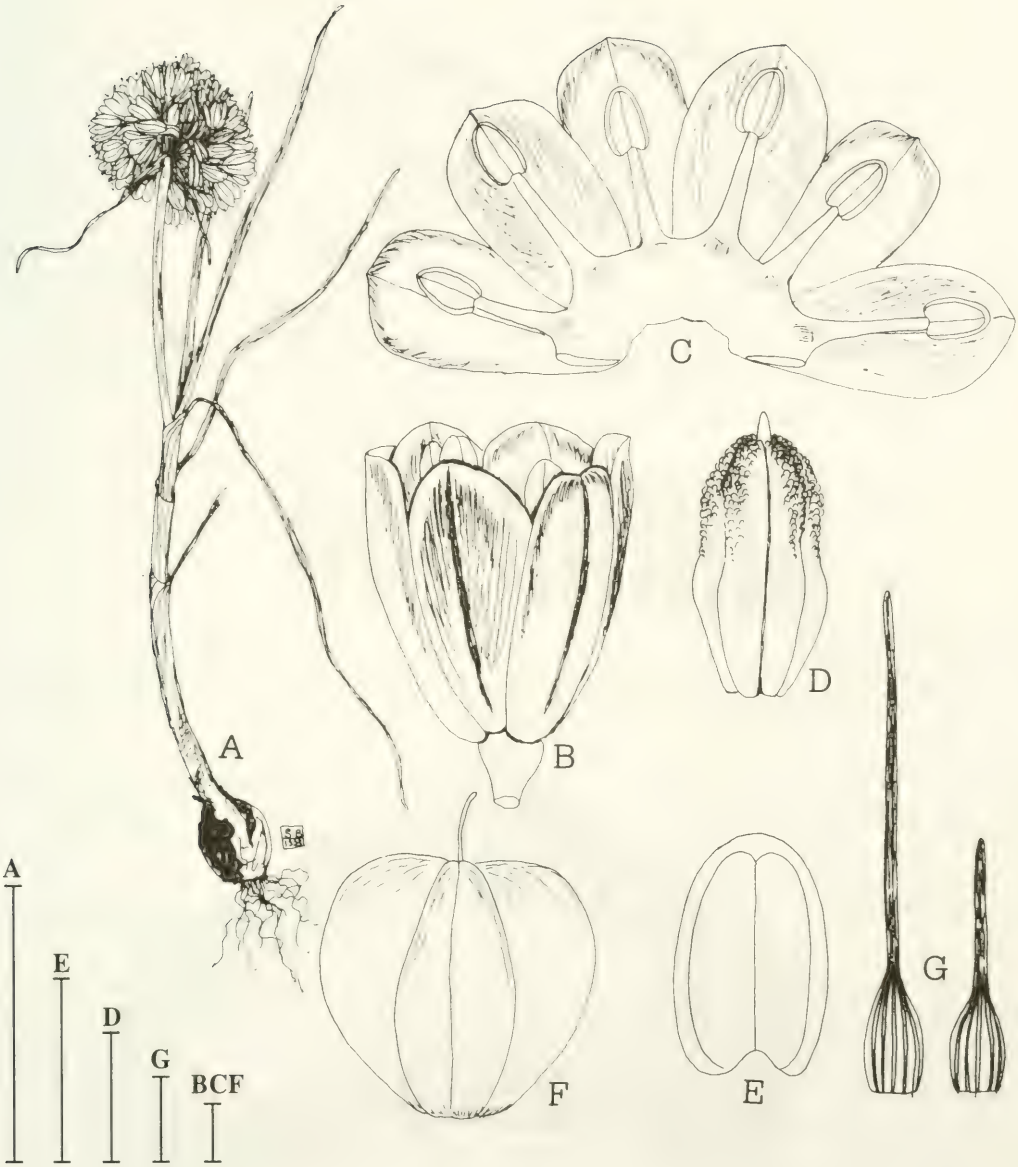
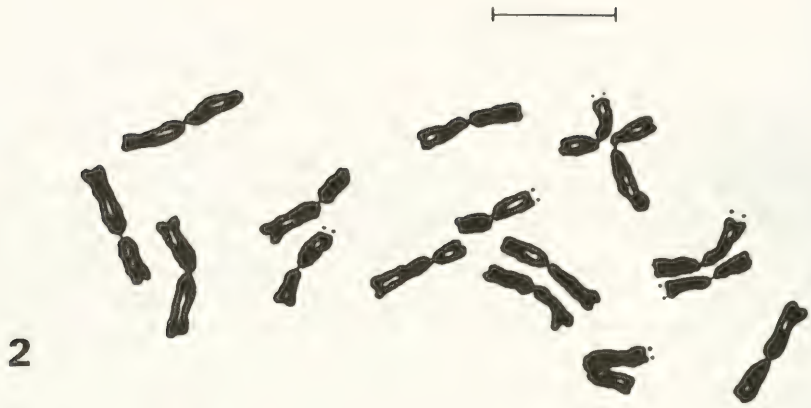


Fig.1. *Allium valdesianum* Brullo, Pavone & Salmeri – A: Habit. B: Flower. C: Perigon with stamens. D: Ovary. E: Anther. F: Capsule. G: Spathe valves.
Scale bars: A: 5 cm; B, C, E, F: 1 mm; D: 2 mm; G: 1 cm.



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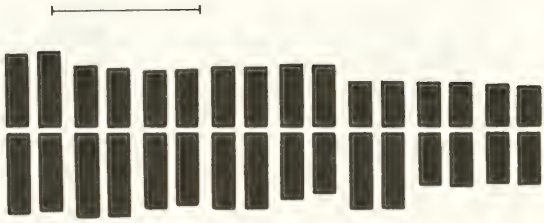

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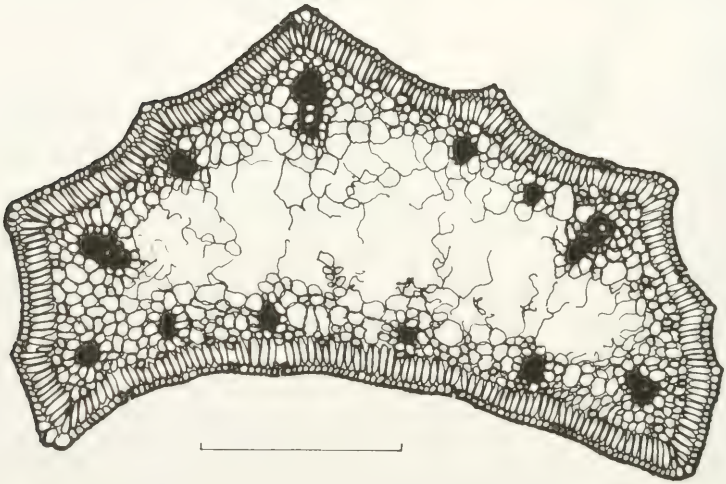

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Fig. 2. Mitotic metaphase plate of *A. valdesianum* (from the type locality).
Fig. 3. Karyogram of *A. valdesianum*
Fig. 4. Leaf cross section of *A. valdesianum* (from the type locality).
Scale bars: Fig. 2, 3: 10 µm; fig. 4: 0.5 mm.

Drosera kansaiensis – eine neue Art aus Japan

P. DEBBERT

Zusammenfassung:
DEBBERT, P.: Drosera kansaiensis – eine neue Art aus Japan. – Sendtnera 3: 101–102. 1996.– ISSN 0944–0178.

Eine neue *Drosera*-Art aus Japan wird beschrieben.

Abstract:
A new species, *Drosera kansaiensis* from Japan is decribed.

Seit mehreren Jahren habe ich eine *Drosera*-Art aus dem südwestlichen Japan in Kultur, die mit keiner bisher bekannten Art identifiziert werden konnte. Ihre Merkmale haben sich unverändert erhalten, so daß ich sie jetzt als neue Art beschreibe.

Drosera kansaiensis P.Debbert, **sp. nov.**
Holotypus: Kansai, Südwest-Japan; kultiviert im Bot. Garten München, 22.7.1995, *Debbert 9* (M; Iso: B).

Differt ab *D. spathulata* Labill. cui simillima pedunculis ad duplum longioribus, petalis rufis, et stigmate roseo.

Plantae perennes, herbaceae, rosulares, foliis solo dense appressis. Radices 3 ad 4, ad 11 cm longi et c. 1–1,5 mm crassi, iramosi. Petioli 6 mm longi, 1,5 mm lati, margine et subtus pilis parcis albidis obtecti, supra glabri. Lamina foliorum spatulata, c. 10 mm longa et 4–5 mm lata, subtus pilis c. 0,5 mm longis albidis obtecta. Stipulae albi-membranaceae, tripartitae, laciniis lateralibus quam media angustioribus. Pedunculi 1–4, aphylli, 18–26 cm longi, 0,5–0,8 mm crassi, basi curvati, pilis paucis albidis et tentaculis brevibus, apicem versus tentaculis distincte longioribus obtecti, in parte basali brunneoli, apicem versus dilute virides, racema 8–12 cm longa et 8–16 flora gerentes. Pedicelli florium basalium c. 5 mm, florium apicalium 1–1,5 mm longi. Calyx c. 1,5 mm longa, sepalis 5, ca. 1 mm lata, basi per 0,4 mm connatis, dorso glandulosis. Petala 5, obovata, rufidula, non contigua, 4 mm longa et 2 mm lata. Stamina 5, c. 1,3 mm longa, filamentis basi albis apice roseis, grana pollinis aurantiaca. Ovarium globosum, dilute viride, 0,7–1 mm diametro. Styli 3, basi breviter connati, 2 mm longi, bipartiti, ramis filiformibus, basi albi apice rosei. Stigmata filiformia, integra, rosea.

Ausdauernde, krautige Rosettenpflanze mit dicht am Boden liegenden Rosettenblättern. Wurzeln 3–4, bis zu 11 cm lang und ca. 1–1,5 mm dick, im unteren Bereich verzweigt. Blattstiel 6 mm lang und 1,5 mm breit, am Rande und unterseits schwach mit weißlichen Haaren besetzt, oberseits kahl. Blattspreite spatelförmig, 10 mm lang und 4–5 mm breit, auf der Unterseite mit ca. 0,5 mm langen weißlichen Haaren besetzt. Nebenblätter pergamentartig, weiß, aus 3 Zipfeln bestehend, die beiden äußeren schmäler als der mittlere. Blütenschäfte einzeln oder zu 2–4, 18–26 cm lang, 0,5–0,8 mm dick, 8–16 Blüten tragend, an der Basis gekrümmt, mit einigen weißlichen Haaren besetzt und schwach mit kurzen, im oberen Teil mit deutlich längeren Tentakeln versehen, im unteren Teil bräunlich, im oberen Teil hellgrün; Schaftlänge im Blütenbereich 8–12 cm. Blütenstiele im unteren Bereich 5 mm lang, nach oben bis auf 1–1,5 mm verkürzt. Kelchblätter zu 5, ca. 1,5 mm lang und 1 mm breit, am Grund auf 0,4 mm verwachsen, auf der Außenseite drüsig, innen kahl. Blütenblätter 5, verkehrteiförmig, rötlich, sich nicht überlappend, 4 mm lang und 2 mm breit. Staubblätter 5, ca. 1,3 mm lang, Staubfaden im unteren Teil weiß, in der oberen Hälfte rosa; Pollen orangefarben. Fruchtknoten kugelförmig, hellgrün, 0,7–1 mm im Durchmesser. Griffel 3, an der Basis kurz verwachsen, in je 2 fadenförmige Äste geteilt, 2 mm lang, in der unteren Hälfte weiß, in der oberen Hälfte rosa. Narben fadenförmig, ungeteilt, rosa.
Die Blütezeit ist im Gewächshaus von Mitte Mai bis Ende Juli. Die wohl genetisch bedingte Öffnungszeit der Blüten ist von 9 bis 14 Uhr (mitteleuropäischer Sommerzeit).

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Gloeopeziza cuneiformis (Leotiales, Ascomycetes) – ein neuer Lamellenbewohner von Polytrichum

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Zusammenfassung:
DÖBBELER, P.: Gloeopeziza cuneiformis (Leotiales, Ascomycetes) – ein neuer Lamellenbewohner von Polytrichum. – Sendtnera 3: 103–109. 1996. – ISSN 0944–0178.

Gloeopeziza cuneiformis (Leotiales, Ascomycetes) wird neu beschrieben. Der Parasit besiedelt die Spalten zwischen den Blattlamellen verschiedener Arten der Gattung *Polytrichum*. Die Art wird mit der häufigeren *G. interlamellaris* verglichen, die nur auf *P. sexangulare* vorzukommen scheint. Charakteristisch für *G. cuneiformis* ist die Infektion einzelner Zellen der Wirtslamellen durch feine Haustorien, die den oberflächlichen Hyphen entspringen.

Abstract:
Gloeopeziza cuneiformis (Leotiales, Ascomycetes), a new *Gloeopeziza* found in the spaces of the longitudinal leaf lamellae of different species of *Polytrichum*, is described and illustrated. The species is compared with the more common *G. interlamellaris*, which seems to be restricted to *P. sexangulare*. Characteristic of *G. cuneiformis* is the infection of single cells of the host lamellae by delicate haustoria originating from the superficial hyphae.

Gloeopeziza cuneiformis * Döbbeler, **sp. nov**.
Holotypus: Österreich, Steiermark, Niedere Tauern, Schladminger Tauern: Süd-Seite des Schwarzen-Sees am Ende des Kleinsölktales, südlich Gröbming, um 1150 m, auf *Polytrichum commune* Hedw. gemeinsam mit *Epibryon interlamellare* (Racov.) Döbbeler und *Lizonia emperigonia* (Ces. & De Not.) De Not., 7.10.1979, *H. Mayrhofer & Döbbeler 6748* (M; Iso: B, GZU, W).

Abb. 1 – 9

Species nova *Gloeopezizae interlamellari* valde similis, sed ab ea praecipue ascis sporisque minoribus, hyphis crassioribus et haustoriis in cellulis lamellarum formantibus differt. Habitat parasitice inter lamellas foliorum specierum variarum *Polytrichi*.

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* Etymologie: cuneiformis (lat.) = keilförmig, bezieht sich auf die Fruchtkörperform, insbesondere auf den zwischen den Lamellen eingesenkten, unteren Teil.

Fruchtkörper zwischen den Blattlamellen von *Polytrichum* gebildet und sie keilförmig auseinanderdrückend, in Aufsicht elliptisch bis spindelig, etwa (65–)80–160 (–500) µm lang, 15–50 µm breit, selten (nur wenn weit hervorragend) in Aufsicht kreisrund, (80–)100–120(–140) µm hoch, die Lamellen meist etwas überragend und sie seitlich überwachsend, seltener völlig eingesenkt oder sehr weit hervorragend (und dann nur basal keilförmig verschmälert), farblos, ohne Borsten, gallertig. Gehäuse von paraphysenartigen Hyphen gebildet (textura porrecta), vor allem an den Breitseiten oft rückgebildet bis fehlend; an der Basis Fruchtkörper durch in Lamellenlängsrichtung verlaufende Hyphenstränge scharf und linienförmig begrenzt, in diesem Bereich zum Teil bräunliche, ziemlich große, bis 5 µm dicke Zellen in unregelmäßigen Geflechten. Paraphysen fädig, etwa 1,5–2 µm dick, verzweigt, ohne Anastomosen, apikal gerne gebogen und die Asci bedeckend, nicht kopfig verdickt. Asci unitunicat, (35–)45–60(–65) × 8–11 µm, keulenförmig, achtsporig (nicht selten auch mit weniger als 8 Sporen); von sehr plasmareichen, verzweigten ascogenen Hyphen gebildet; Haken fehlend. Jod (Lugolsche Lösung, Merck 9261) färbt den Apikalapparat im Ascusscheitel rötlich (hemiamyloide Reaktion, BARAL 1987), manchmal Reaktion sehr schwach oder fehlend, KOH + J: Apikalapparat blau; apikaler Ring bis 3(–5) µm im Durchmesser. Sporen (9,5–)11–15(–16,5) × (2,5–)3–5(–5,5) µm, ellipsoidisch, bisweilen leicht gebogen, meist einzellig, jedoch manchmal (auch bei noch im Ascus liegenden Sporen) mit einer Querwand, farblos, Epispor glatt. Hyphen 2–4 µm dick, farblos bis bräunlich, mit z. T. cyanophilen Wänden, verzweigt und anastomosierend, unregelmäßig über die Wirtszellen wachsend oder die Antiklinen bevorzugend, auf der Rippe (also an der Lamellenbasis) gerne in 6–13 µm dicken Strängen in Lamellenlängsrichtung verlaufend; den Hyphen entspringen äußerst feine, weniger als 0,5 µm dicke Senker (Perforationshyphen), die die Zellwände durchbohren und ein intrazelluläres Haustorium bilden; Appressorien fehlend. Haustorien aus knäuelig ineinander verschlungenen, verzweigten, unseptierten, bis 2 µm dicken Fäden bestehend, die befallenen Zellen teilweise oder ganz ausfüllend; infizierte Zellen teils unverändert, teils dunkelbraun verfärbt.

Wirte: *Polytrichum alpinum* Hedw. (Syn.: *Pogonatum alpinum* (Hedw.) Röhl., *Polytrichastrum alpinum* (Hedw.) G.L.Smith)
Polytrichum commune Hedw.
Polytrichum longisetum Sw. ex Brid. (Syn.: *Polytrichastrum longisetum* (Sw. ex Brid.) G.L.Smith, *Polytrichum gracile* Dicks.)

Bisher bekannte Verbreitung: Deutschland, Österreich, Rußland (Sibirien)

Belege:

Deutschland: Baden-Württemberg: Moor bei Ellerazhofen, Amt Leutkirch, auf *Polytrichum longisetum*, VII.1902, *Wälde* (GZU, Migula, Krypt. Germ. Austr. Helv. Exs. 139, sub *P. gracile*).

Rußland: Sibirien: East Sajan, basin of the river Uda, stream Kastarma, 1500 m, auf *Polytrichum alpinum*, vergesellschaftet mit *Potriphila navicularis* Döbbeler, 15.7.1961, *Bardunov* (B).

Diskussion

Die Ascocarpien werden im oberen Bereich der Pflanzen gebildet. Die ersten erscheinen etwa 0,5 cm unterhalb des Vegetationspunktes. Sie finden sich auf den Blättern über einen bis 2 cm langen Achsenabschnitt. Weiter unten sind sie nicht

mehr nachweisbar. Vor allem die deutlich hervorragenden und gedrängt stehenden Fruchtkörper können mit Algen oder nectrioiden Pilzen verwechselt werden. Befallene Pflanzen erleiden keinen sichtbaren Schaden. Auffallend wenngleich nicht unerwartet ist die oft reihenförmige Anordnung der Fruchtkörper. Die Hyphen verlaufen vornehmlich in Längsrichtung der Lamellen. Hier entstehen die Initialen und schließlich die Ascocarpien, die seitlich verschmelzen können, so daß im Extremfall bis 500 µm lange Gesamtfruchtkörper entstehen. Ähnlich variabel in der Länge sind die Fruchtkörper bei der ebenfalls lamellenbewohnenden *Dawsicola neglecta* Döbbeler (DÖBBELER 1981). Eine Bevorzugung oberer oder unterer Bereiche im Blatt ist nicht erkennbar.

Die Haustorien entspringen dem oberflächlich verlaufenden Myzel und infizieren nur die Zellen der Lamellen sowie deren zur Blattrippe gehörende Fußzellen, die HÉBANT (1977, Legende zu Fig. 108) als obere Epidermis bezeichnet, während SMITH (1971: 8) von Ventralzellen spricht. Vereinzelt werden selbst die durch Funktion und Bau abweichenden Lamellenendzellen befallen. Die haarartigen Auswüchse der Lamellen bleiben dagegen völlig frei von Hyphen.

Vereinzelte, weit aus den Lamellenspalten hervorragende Fruchtkörper sind typische Apothecien. Die Ascusmerkmale sprechen für eine Zugehörigkeit zu den Leotiales. Große Ähnlichkeit besteht zu der ebenfalls lamellenbewohnenden *Gloeopeziza interlamellaris* Döbbeler (DÖBBELER 1986, Abb. 19, 20; 1987: 93), die obligat das Schneetälchenmoos *Polytrichum sexangulare* Brid. besiedelt. Jedoch existieren einige Unterschiede, die womöglich einmal eine generische Trennung der beiden Arten erforderlich machen. Tabelle 1 zeigt die abweichenden Merkmalsausprägungen.

Tab. 1: Unterschiedliche Merkmale bei *Gloeopeziza cuneiformis* und *G. interlamellaris*

Merkmale	*Gloeopeziza cuneiformis*	*Gloeopeziza interlamellaris*
Fruchtkörper	eingesenkt bis deutlich hervorragend	eingesenkt bis wenig hervorragend
Asci	45 – 60 × 8 – 11 µm, nicht phototrop	55 – 85 × 11,5 –18 µm, phototrop
Jodfärbung (Lugol)	Apikalapparat rötlich	Apikalapparat blau
Sporen	11 – 15 × 3 – 5 µm, ein- bis seltener zweizellig	13 – 16 × 5,5 – 7 µm, stets einzellig
Hyphen	2 – 4 µm dick, oberflächlich, mit Haustorien in einzelnen Lamellenzellen	ca. 1 µm dick, oberflächlich, mit Hyphen in den Zellwänden der Haarzellen
Befall	schwach bis stark	stets schwach
Wirte	*Polytrichum* sp. div.	*Polytrichum sexangulare*

Die Beziehungen zwischen *Gloeopeziza cuneiformis* und der Typusart der Gattung *G. rehmii* Zukal, die auf dem Lebermoos *Blepharostoma trichophyllum* (L.) Dumort. wächst (ZUKAL 1891), sind unklar. Das Originalmaterial von *G. rehmii* ist weder in W noch in WU auffindbar. Ein enges Gattungskonzept scheint mir derzeit

ohne nähere Kenntnis der zahlreichen zu beschreibenden bryophilen Leotiales, nicht sinnvoll zu sein.

Polytrichaceen werden von einer ganzen Reihe von freilich meist sehr viel auffallenderen leotialen Ascomyceten besiedelt (vgl. die Zusammenstellung bei DÖBBELER 1986). Von allen diesen Arten läßt sich *Gloeopeziza cuneiformis* durch die Kombination folgender Merkmale sicher unterscheiden: Sie besiedelt die spaltenförmigen Lamellenzwischenräume und hat entsprechend geformte, einfach gebaute, gallertreiche, farblose Gehäuse. Die Asci weisen im typischen Fall einen mit Lugolscher Lösung rötlich reagierenden Apikalapparat auf. Die Sporen sind ein- oder zweizellig, und das oberflächliche Myzel bildet knäuelförmige Haustorien in einzelnen Lamellenzellen.

Frau Dr. D. Triebel (München) danke ich für einige Hinweise.

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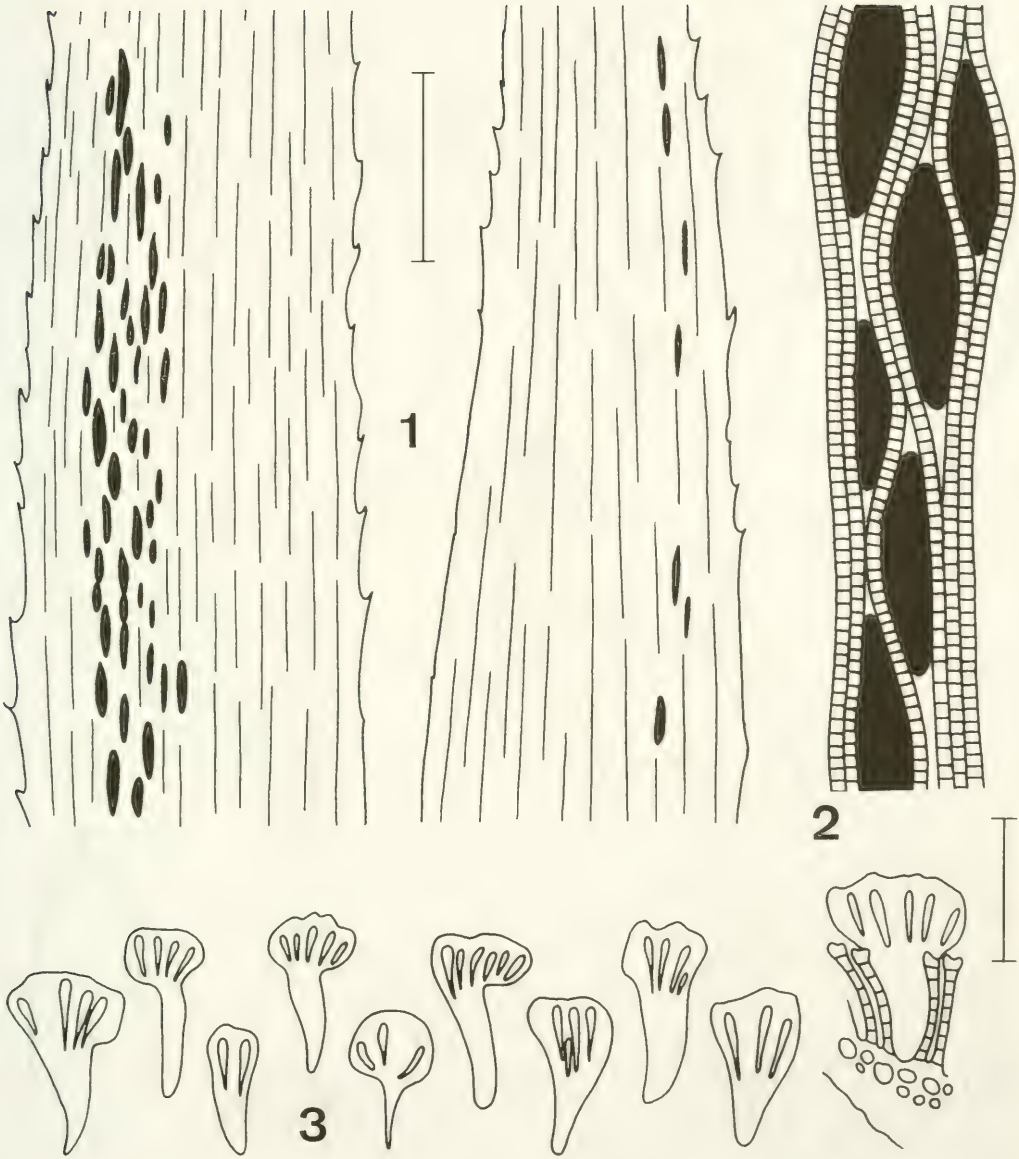

Abb. 1 – 3: *Gloeopeziza cuneiformis* (Holotypus)
1. Blattausschnitt von *Polytrichum commune* mit Fruchtkörpern in Aufsicht, links sehr starker Befall; Maßstab = 0,5 mm. – 2. stark befallene Lamellenzwischenräume in Aufsicht, schematisch. – 3. Quergeschnittene, die Lamellen meist deutlich überragende Fruchtkörper im Umriß. – Maßstab für Abb. 2 und 3 = 100 µm.

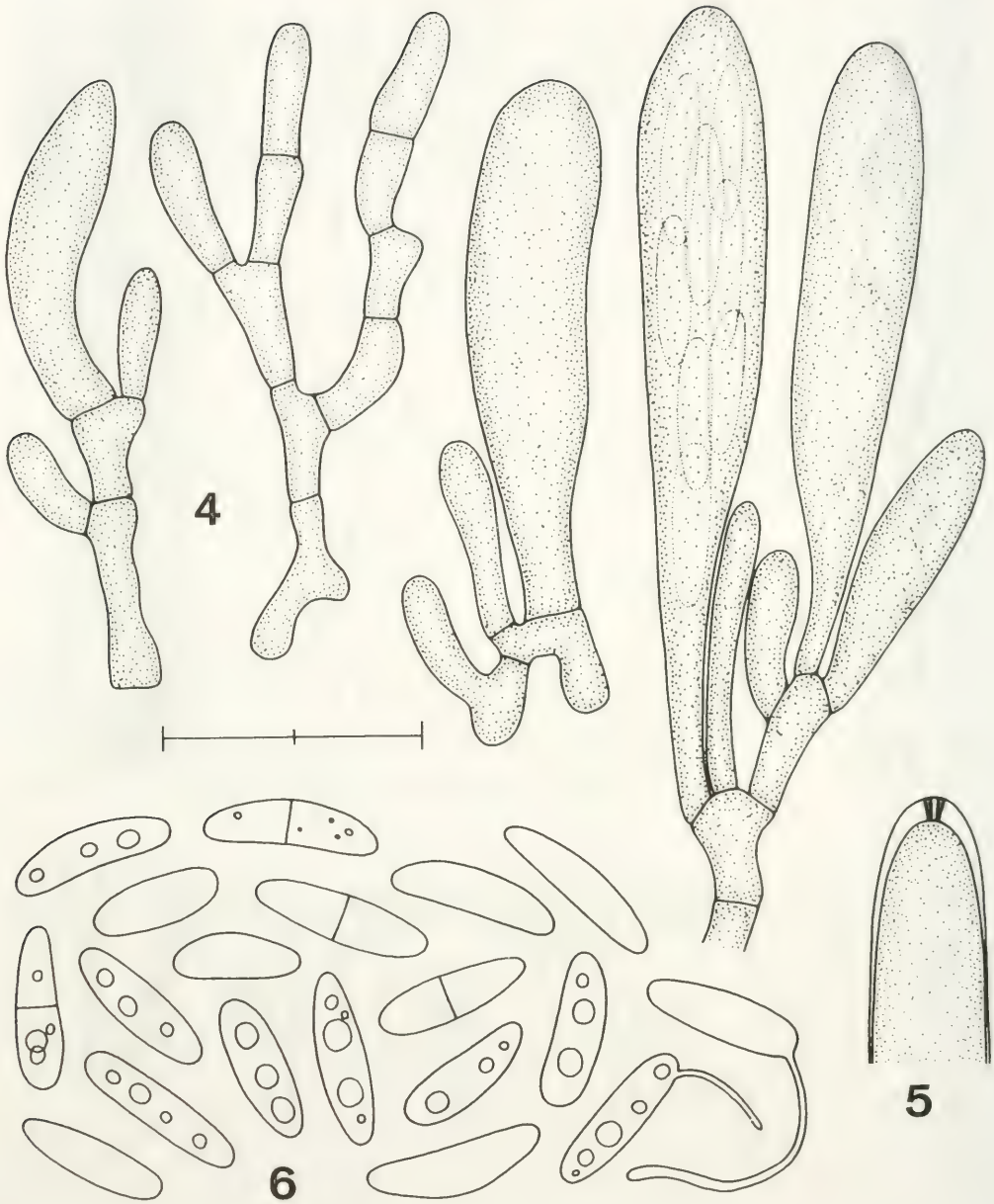

Abb. 4 – 6: *Gloeopeziza cuneiformis* (Holotypus)
4. Ascogene Hyphen mit sich entwickelnden Asci. – 5. Porus im Scheitel eines unreifen Ascus nach Behandlung mit Lugolscher Lösung. – 6. Sporen, rechts zwei auskeimende. – Maßstab = 20 µm.

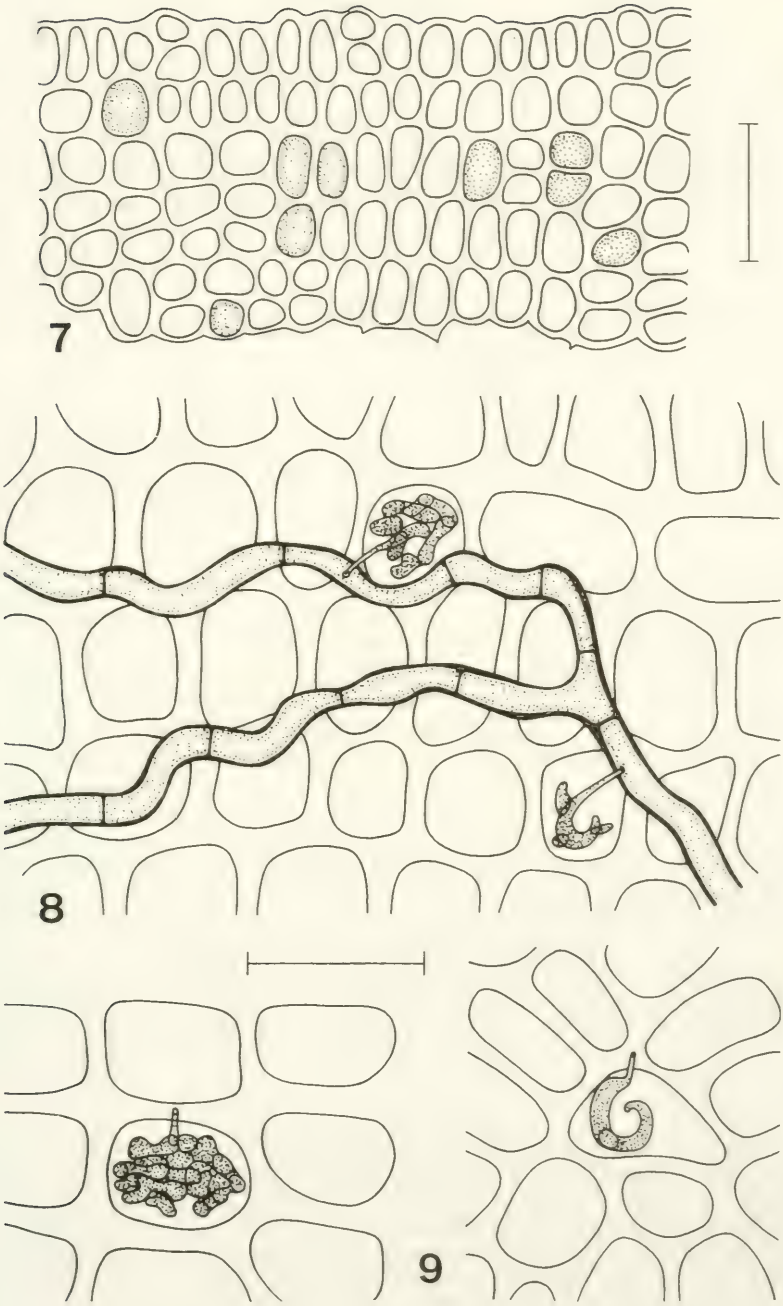

Abb. 7 – 9: *Gloeopeziza cuneiformis* (Holotypus)
7. Abgerissene Lamellenplatte von der Seite betrachtet, dunkel gefärbte Zellen mit Haustorien punktiert; Maßstab = 30 µm. – 8. Über die Lamellen verlaufende Hyphe mit zwei intrazellulären Haustorien. – 9. Intrazelluläre Haustorien. – Maßstab für Abb. 8 und 9 = 15 µm.

Kritische Arten der Gattung Calceolaria aus Chile IV Calceolaria poikilanthes Sandwith – neu für Chile

C. EHRHART

Zusammenfassung:
EHRHART, C.: Kritische Arten der Gattung Calceolaria aus Chile IV. Calceolaria poikilanthes Sandwith – neu für Chile. – Sendtnera 3: 111–118. 1996. – ISSN 0944–0178.

Calceolaria poikilanthes, eine seltene, bisher nur aus der südlichen Andenregion Argentiniens bekannte Art, kann nun auch für Chile nachgewiesen werden. Die sicher auch in Argentinien nahezu unbekannte Art existiert in den chilenischen Herbarien mit lediglich drei, bislang falsch zugeordneten Aufsammlungen.
C. poikilanthes zeichnet sich im Gegensatz zu allen übrigen Calceolarien mit rosettigem Wuchs durch ihre abgeflachten, cremefarbenen Blüten aus, wobei die Unterseite der Unterlippe durch eine dunkelrote bis braunviolette, mäanderartige Zeichnung auffällt.

Resumen:
Calceolaria poikilanthes, una especie rara, hasta ahora solamente conocida de los Andes del sur de Argentina, se cita por primera vez para Chile. La especie, casi también desconocida en Argentina, está representada en los herbarios chilenos solamente por tres especímenes hasta ahora mal determinados.
Contrariamente a todas las especies de Calceolaria con una roseta radical, *C. poikilanthes* se caracteriza por presentar corolas aplanadas, de un color pálido-crema y además, por el labio inferior con lineas rojas oscuras muy características en la parte inferior.

Kleinwüchsige, matttenbildende Arten mit Blattrosette und meist nur wenige Blüten tragende Infloreszenzen stellen innerhalb der Gattung Calceolaria eine Wuchsform dar, die besonders häufig entlang den höheren Andenregionen Chiles und Argentiniens bis nach Patagonien anzutreffen ist. Ein bislang unbekannter Vertreter dieses Typs ist *Calceolaria poikilanthes. C. poikilanthes* wurde 1927 von Sandwith nach einer Aufsammlung von Comber beschrieben, der die Art in der Cordillera Suangulo (Neuquén, Dep. Aluminé, Argentinien) gesammelt hatte.

Habituelle, auf der Wuchsform beruhende Ähnlichkeiten und die meist unzureichende Kenntnis der Blütenmorphologie bereiten bis heute große Schwierigkeiten in der Interpretation der rosettigen Arten. In den Genera et Species Plantarum Argentinarum von DESCOLE (1954) wird *C. poikilanthes* am Schluß der Bearbeitung wegen fehlenden Typusmaterials zu den nicht identifizierbaren Arten gestellt. Es ist

daher auch sehr fraglich, ob Aufsammlungen dieser Art in den argentinischen Herbarien unter ihrem zutreffenden Namen liegen.

Eine aus jüngster Zeit stammende Aufsammlung aus der Andenregion im Gebiet des Vulkans Villarica in Chile von Manfred Finkh vom geobotanischen Institut der Universität Bayreuth gab den Anlaß diese für Chile völlig unbekannte Art zu klären. *C. poikilanthes* ist in Chile bislang sehr selten gesammelt worden; in den Herbarien von Santiago und Concepción fanden sich lediglich drei Aufsammlungen, die anderen kleinwüchsigen Arten mit Blattrosette zugeordnet waren.

Vorliegendes Typusmaterial, eigene Feldstudien, sowie die Kultivierung dieser Art in München aus Samen vom Wildstandort ließen jetzt eine eindeutige Charakterisierung von *C. poikilanthes* zu. Dabei sind auch hier die wichtigsten Kriterien und trennenden Merkmale, wie schon mehrfach erläutert (GRAU & EHRHART 1991, 1993, EHRHART 1994) im blütenmorphologischen Bereich zu finden.

Calceolaria poikilanthes Sandwith, Kew Bulletin, 183. 1927. **Typus**: [Argentinien] Cordillera Suangulo, Pulmarí, 6000–6500 ft, 16.1.1926, *Comber 487* (E!).

Abb. 1–4

Habitus: Ausdauernde, niedrige Rosettenpflanze, die mit kurzen verzweigten Rhizomen sehr kompakte, dem Untergrund dicht angeschmiegte Matten bildet. Rosetten wenigblättrig meist von nicht mehr als fünf Blättern gebildet. Blätter: Hellgrün, kräftig-fleischig bis fast starr, obovat bis rundlich oder breit eiförmig, mit abgerundeter Spitze, z. T. leicht ausgerandet, undeutlich in einen kurzen Stiel verschmälert. Länge (1,5–)3(–4,5) cm, Breite (1–)2(–3,5) cm, Stiel bis zu 8 mm lang und 5 mm breit; Blattrand ganzrandig, auffällig mit bis zu 3 mm ungewöhnlich langen (bis zu 12 Zellen), weißen Haaren bewimpert. Blattoberfläche spärlicher behaart, Blattunterseite kahl, nur an den deutlich hervortretenden Hauptnerven wenige Haare. Sproß: Bis zu 15 cm hoch, drüsig behaart, völlig blattlos, ein bis zwei Blütensprosse aus einer Blattrosette hervorgehend. Infloreszenz: Wenigblütig, selten mehr als zwei Blüten, ohne Tragblätter. Einzelblüten 1–3 cm gestielt. Blüten: Mittelgroß, flach aufgeblasen, in der Farbe zartgelb bis cremefarben, die Schlundinnenseite mit waagrecht verlaufenden, dunkelroten Linien gezeichnet, die Oberseite der Unterlippe mit zarten, dunkelroten Strichen am Übergang in den Hohlraum der Unterlippe, die Unterseite der Unterlippe mit dunkelroten bis braunvioletten, mäanderartigen Linien auffällig kontrastreich gezeichnet. Kelch: Sehr klein, eng an die Blüte angeschmiegt, Kelchblätter eiförmig zugespitzt, 2,5–4 × 2–3 mm, auf der Innenseite nur vereinzelt kurze Drüsenhaare, die Außenseite deutlich dichter mit längeren Drüsenhaaren besetzt. Oberlippe: Haubenförmig über Antheren und Griffel gewölbt, 2,2 mm lang und 5,5 mm breit, die in den Hohlraum der Unterlippe führende Öffnung nicht verschließend. Unterlippe: Waagrecht zur Oberlippe stehend, in Aufsicht annähernd kreisrund mit (1–)1,5(–2) cm im Durchmesser, von der Seite gesehen leicht abgeflacht, mit bis zu 1 cm Höhe, im Verhältnis zur Oberlippe sehr groß erscheinend. Von vorne betrachtet flach elliptisch, z. T. aber auch leicht rinnig gebogen. Unterlippe weit geschlossen, nur eine schmale, ovale Öffnung in den Hohlraum bildend. Der in die Höhlung einbiegende, zungenartig verlängerte Teil der Unterlippenoberseite krümmt sich retroflex in diese hinein. Er trägt auf seiner ganzen Fläche verstreut sehr kurze (mit 1 bis 2 breiten Stielzellen) Drüsenhaare, die einen vielzelligen, breiten Drüsenkopf tragen (vgl. *C. arachnoidea*, EHRHART 1994). Staubblätter: Mit bis 1 mm langen Filamenten, die gleichgebauten Antheren bis 2,3 mm lang. Fruchtknoten: Sehr dicht mit kurzen Drüsenhaaren besetzt, der Griffel kahl. Fruchtknoten mit Griffel und Narbe 3,5 mm lang. Kapsel: Gedrungen 6 mm breit und 5 mm lang.

Blüte und Fruchtzeit: *C. poikilanthes* blüht in Chile im Januar, in Kultur in München im Juli. Sie setzt auch in Kultur Kapseln an, die innerhalb drei Wochen heranreifen.
Verbreitung: Alle Aufsammlungen von *C. poikilanthes* in Chile stammen aus der IX. Región de la Araucanía. *C. poikilanthes* besiedelt offene Ebenen der höheren Lagen der Hauptkordillere von 1300–1800 und benötigt einen feuchten, von kleineren Fließgewässern durchzogenen Untergrund mit Hochmoorcharakter.

Untersuchtes kultiviertes Material:

Chile. IX Región de la Araucanía. Prov. de Cautín: Parque Nacional Villarica, Sektor Puesco, hochmoorartige Ebene am westlichen Ende der Laguna de los Patos, 1450 m, 16.1.1995, *Ehrhart & Sonderegger 95/754* (MSB).

Untersuchtes Herbarmaterial:

Argentinien. Prov. Neuquén: Dep. Aluminé, Cordillera Suangulo, Pulmarí, 6000–6500 ft, 16.1.1926, *Comber 487* (E).
Chile. IX Región de la Araucanía. Prov. de Cautín: Parque Nacional Villarica, Sektor Puesco, hochmoorartige Ebene am westlichen Ende der Laguna de los Patos, 1450 m, 16.1.1995, *Ehrhart & Sonderegger 95/754* (MSB, Hb. EHRHART) – dito, 19.1.1994, *Finkh 5149* (Hb FINKH). – Prov. de Malleco: Camino entre Liucura y Pino Hachado, km 19, 1300 m, 38°38'–71°00', II.1960, *Ricardi & Marticorena 5067* (CONC 26042) – Lonquimay, Camino a Paso Pino Hachado, 1680 m, 38°40'–71°05', *Pfister* (CONC 8077) – Volcán Tolhuaca, I/II 1925, *Pennell 12737* (SGO).

Der vorliegende Typusbeleg ist als Cotypus gekennzeichnet. Da anzunehmen ist, daß weitere Belege in K oder BM existieren, wird ein Lectotypus auszuwählen sein.

C. poikilanthes wurde zum erstenmal in Chile 1925 (noch vor Comber) von Pennell (*Pennell 12737,* SGO) gesammelt. Er hielt die Art für unbeschrieben und gab ihr den Manuskriptnamen „marmorata", der die mäanderartige Zeichnung der Unterlippenunterseite gut charakterisiert, veröffentlichte diesen aber nie.

Die chilenischen Arten der Gattung *Calceolaria* besitzen in den meisten Fällen eine eher eingeschränkte Verbreitung. Von dieser charakteristischen Regel machen bemerkenswerterweise auch die Arten feuchter Standorte und der südlichen Bereiche Chiles keine Ausnahme. Sie stehen damit im Gegensatz zu zahlreichen anderen Gattungen, deren Vertreter in langgestreckten Arealen größere Bereiche Südchiles umspannen. *C. poikilanthes* kann für die Verbreitungscharakteristika der Gattung *Caceolaria* daher als besonders typisch gelten.

Die Tatsache, daß *C. poikilanthes* bisher nahezu unbekannt geblieben ist, liegt in der Unzugänglichkeit der meisten ihrer Fundorte, wie auch ihr seltenes Auftreten am Standort. Das lebende Material, das von einer Hochebene nordwestlich des Vulkans Lanín aus dem Parque Nacional Villarica stammt, konnten wir erst nach wiederholten Versuchen bei mehrstündigem Aufstieg durch unwegsamen Nothofagus-Chusquea Wald finden.
Lediglich im Gebiet von Pino Hachado steht die Art etwas zugänglicher. Dies drückt sich auch dadurch aus, daß *C. poikilanthes* in einem in den 80er Jahren erschienenen populärwissenschaftlichen Werk (OLIVARES 1980), allerdings ohne Namen, abggebildet wurde.

C. poikilanthes läß sich gegenüber anderen rosettenbildenden *Calceolaria*-Arten in einigen Merkmalsbereichen gut abgrenzen:

Ihre flach aufgeblasenen, von oben betrachtet annähernd kreisrunden Blüten zeichnen sich durch die für *Calceolaria* ungewöhnliche, zart hellgelbe bis cremefarbene Farbe und die auffällig braun-violett gezeichnete Unterseite der Unterlippe aus.

Im Herbar läßt sich *C. poikilanthes* u.a. neben der eindeutigen Blütenform und den jeweils nur zwei Blüten tragenden, tragblattlosen Infloreszenzen gut an den breitovalen bis fast rundlichen Blättern mit der langen, abstehenden Behaarung der Blattoberseite erkennen.

Herrn Dr. Manfred Finkh danke ich für das zur Verfügung gestellte Herbarmaterial, sowie für die genaue Standortangabe auf einer topographischen Karte und Herrn Dr. Emanuel Sonderegger für seine Begleitung und Unterstützung auf der Suche nach *C. poikilanthes*.

Literatur

DESCOLE, H.R. 1954: Genera et Species Plantarum Argentinarum 5: 36–92, tab. VIII–XLVI. – Buenos Aires.

EHRHART, C. 1994: Kritische Arten der Gattung *Calceolaria* aus Chile III. – Sendtnera 2: 377–388.

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– 1993: Kritische Arten der Gattung *Calceolaria* aus Chile II. – Sendtnera 1: 289–296.

SANDWITH, N.Y. 1927: New species from the Andes of Argentina 1. – Kew Bulletin. 183.

OLIVARES T., F. 1980: Crónica de una Expedición a Chile. – Santiago.

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Abb. 1 *Calceolaria poikilanthes*: Habitus
Maßstab: 5 cm.

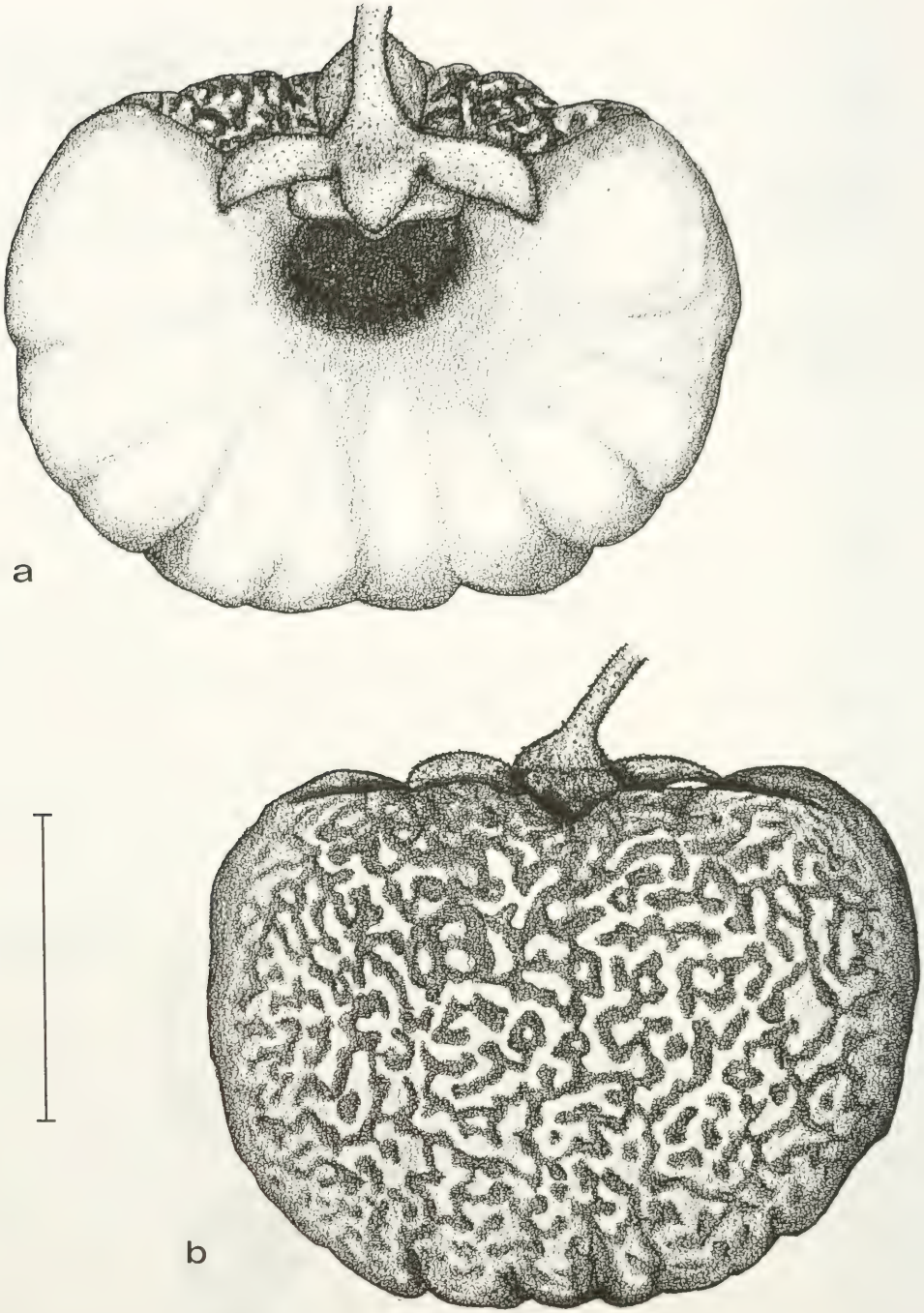

Abb. 2 a: Sicht von oben auf die Blüte
b: Unterseite der Blüte
Maßstab a und b: 1 cm

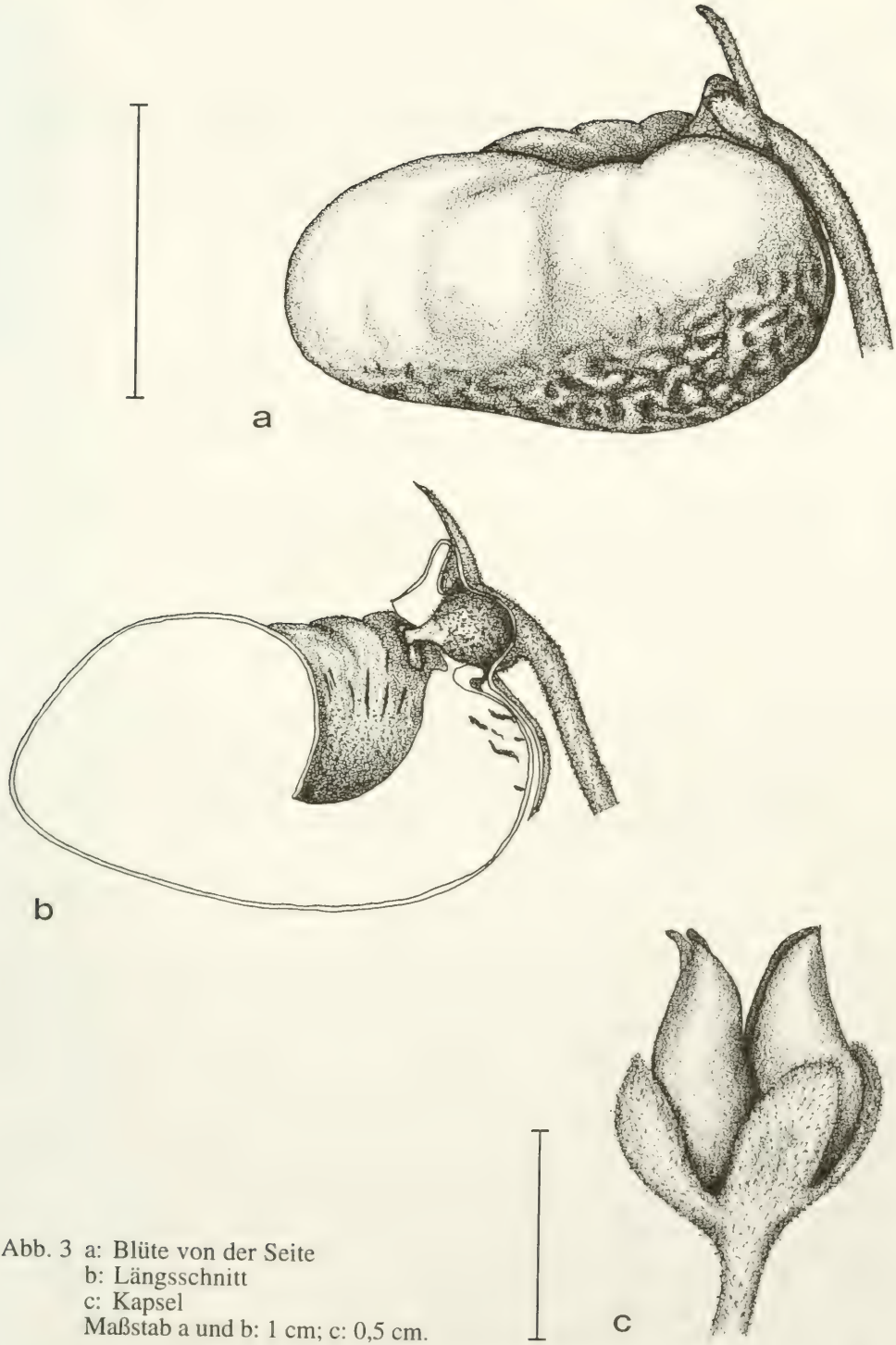

Abb. 3 a: Blüte von der Seite
b: Längsschnitt
c: Kapsel
Maßstab a und b: 1 cm; c: 0,5 cm.

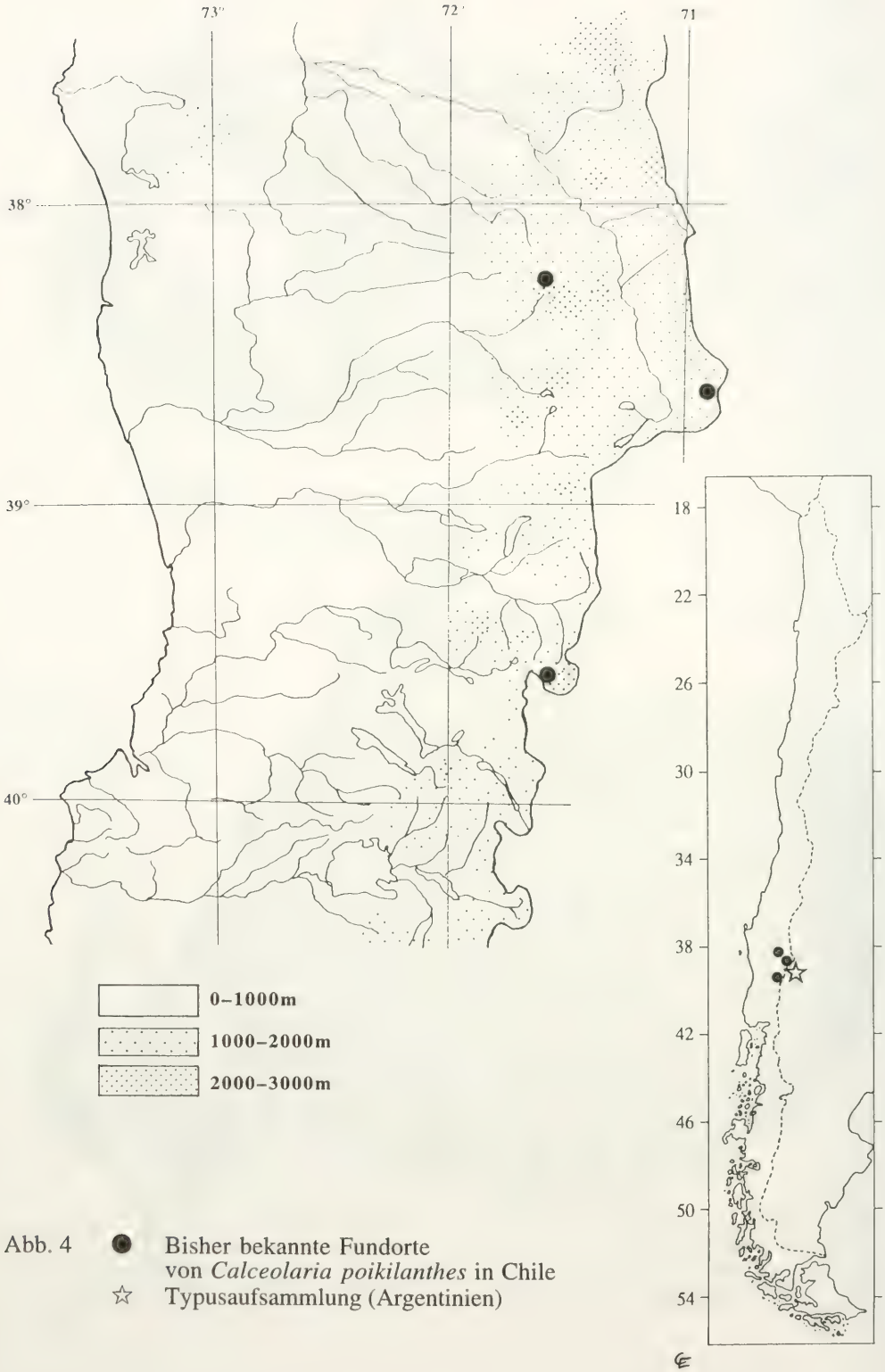

Abb. 4 ● Bisher bekannte Fundorte von *Calceolaria poikilanthes* in Chile
☆ Typusaufsammlung (Argentinien)

Die Ektomykorrhizen von Lactarius chrysorrheus und L. serifluus an Quercus robur*

G. PALFNER und R. AGERER

Zusammenfassung:
PALFNER, G. & AGERER, R.: Die Ektomykorrhizen von Lactarius chrysorrheus und L. serifluus an Quercus robur. – Sendtnera 3: 119–136. 1996. – ISSN 0944–0178.

Ektomykorrhizen von *Lactarius chrysorrheus* and *L. serifluus*, beide an *Quercus robur*, werden ausführlich beschrieben. *Lactarius chrysorrheus*-Ektomykorrhizen werden mit denen von *L. pallidus* and *L. blennius* verglichen, diejenigen von *L. serifluus* mit Ektomykorrhizen von *L. badiosanguineus, L. alpinus, L. camphoratus, L. decipiens, L. mitissimus, L. rubrocinctus, L. subdulcis,* und *L. theiogalus*.

Abstract:
Ectomycorrhizae of *Lactarius chrysorrheus* and *L. serifluus*, both on *Quercus robur* are comprehensively described. *Lactarius chrysorrheus*-ectomycorrhizae are compared with those of *L. pallidus* and *L. blennius*, those of *L. serifluus* with ectomycorrhizae of *L. badiosanguineus, L. alpinus, L. camphoratus, L. decipiens, L. mitissimus, L. rubrocinctus, L. subdulcis,* and *L. theiogalus*.

Einleitung

Die Gattung *Lactarius* gehört zu jenen Genera von Ektomykorrhizapilzen, von denen bisher vergleichsweise viele Arten auf ihre Ektomykorrhizen hin untersucht worden sind. Zwar lassen sich bisher alle Arten anhand von glatten Mänteln und durch den Besitz von Lactiferen in den Mykorrhizen erkennen, doch weisen die Mykorrhizenmäntel in Aufsicht eine erstaunliche Vielfalt auf (AGERER 1995). Es hat den Anschein, daß zumindest die Sektionen *Dapetes* (SINGER 1986) und *Plinthogali* (SINGER 1986), durch einheitliche Mykorrhizenmerkmale gekennzeichnet sind (AGERER 1995). Andere Sektionen erweisen sich als weniger homogen bezüglich solcher Merkmale. Ob tatsächlich die Struktur von Ektomykorrhizen dazu beitragen kann, infragenerische Untergliederungen zu untermauern oder gar zu klären bleibt abzuwarten. Jedenfalls muß das Studium von *Lactarius*-Ektomykorrhizen erheblich intensiviert werden. Mit *L. chrysorrheus* wird ein Vertreter der Sektion *Lactarius* (SINGER 1986), mit *L. serifluus* ein Mitglied der Sektion *Russulares* (SINGER 1986) vorgestellt.

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* Gilt als Studien an Ektomykorrhizen LVI.

Methoden zur Isolierung der Ektomykorrhizen aus dem Boden, zur Vorgehensweise bei der Analyse, sowie wichtige Merkmale wurden bereits zusammengefaßt (AGERER 1991), die verwendeten Termini sind in einem Glossar erklärt (AGERER 1987–1994). Für die vorliegenden Beschreibungen von Schnitten wurde in Historesin eingebettetes Material verwendet (AGERER 1991). Zur Ermittlung des CCq (AGERER 1987–1994) wurden die Längenmaße der äußeren, vom Hartigschen Netz umgebenen Rindenzellen im medianen Längsschnitt nicht streng radial, sondern entlang ihrer geneigten Längsachse gemessen. Die unterstrichenen Werte sind Mittelwerte aus zumindest fünfzehn Messungen; Minimal- und Maximalwerte sind beigegeben.

Die Bestimmung der Pilze erfolgte nach MOSER (1983) unter Zuhilfenahme von RYMAN & HOLMASEN (1992).

Lactarius chrysorrheus (Fr.) Fr. an *Quercus robur* L.

Referenzbeleg: **Slowenien**, Krakovski Gozd, 6.7.1993, *Palfner, GP 111* (M).

Habitus (Abb. 1):

Mykorrhizensysteme bevorzugt in der lockeren Laubstreu, zwischen Schichten abgefallener Blätter, hier oft sehr ausgedehnt und dicht; Verzweigung monopodial-pinnat bis monopodial-pyramidal, unverzweigte Ende gerade bis leicht gebogen; junge Spitzen weißlich-beige bis ocker, meist mit einem fleischfarbenen Beiton, ältere Teile dunkler braun, auch hier häufig noch mit einem Stich ins Fleischfarbene; Oberfläche glatt und wachsig glänzend, fast immer ohne anhaftende Bodenpartikel; besonders an älteren, dunkler pigmentierten Teilen mit dichtem, weiß reflektierendem Lactiferennetz, das in frischem Zustand bei Verletzung weißen, an der Luft kaum verfärbenden Milchsaft absondert; Rhizomorphen zahlreich, dünn und glasig durchscheinend oder dicker, dann häufig wie der Mantel fleischfarben oder an älteren Teilen orange-bräunlich getönt, tangential auf der Manteloberfläche ansetzend, die Mykorrhiza teilweise spiralig umwindend. Achsen der Verzweigungssysteme 2–<u>7,5</u>–23 mm lang, 0,3–<u>0,4</u>–0,5 mm im Durchmesser; unverzweigte Enden bis 1,2(2) mm lang und 0,3(0,4) mm im Durchmesser.

Anatomie (Flächenansicht):

<u>Mantel</u> (Abb. 2, 3) besonders in Spitzennähe oft mit einschichtiger, eng anliegender Auflage aus dünnwandigen, schmal gelappten, bzw. kurz verzweigten, teilweise septierten Zellen; diese im Milchsäurepräparat innen mit sehr feinen Granula oder Tröpfchen (Milchsaft?); Mantelaußenseite epidermoid-pseudoparenchymatisch, aus gelappten bis „puzzleartig" verzahnten Zellen mit leicht aufgequollen, verdickten Zellwänden; mittlere Mantelschichten plectenchymatisch, mit dichtem Netzwerk aus unterschiedlich dicken, verzweigten und stellenweise septierten Milchröhren, diese in frischem Zustand mit stark lichtbrechendem, farblosem, in frischen Milchsäurepräparaten zu Tröpfchen koaguliertem Milchsaft; Mantelinnenseite dicht unregelmäßig-plectenchymatisch mit gestreckten Hyphen und rundlichen, fast pseudoparenchymatischen Zellen, hier nur wenige Lactiferen; in allen tieferen Mantelschichten Zellwände teils mit doliporusartigen Verdickungen. Manteltyp Q (nach AGERER 1995).

Dicht anliegende, kurz verzweigte Hyphen der Manteloberfläche in Spitzennähe 20–<u>31</u>–43 µm und 8–<u>14</u>–18 µm im Durchmesser; Wände bis 0,5 µm dick. Zellen der pseudoparenchymatischen Manteloberfläche 5–<u>10</u>–20 × 5–<u>11</u>–16 µm, Anzahl der Zellen in 20 × 20 µm 6–<u>9</u>–11, Zellwände 0,5–1 µm dick. Hyphen der plectenchymatischen mitteleren Mantelschichten 3–<u>4</u>–5µm dick, Lactiferen 5–<u>8</u>–10 µm im Durch-

messer, Wände bis 0,5 µm dick. Hyphen der Mantelinnenseite 2–4–5 µm im Durchmesser, Wände bis 0,5 µm dick. Mantel der unmittelbaren Mykorrhizenspitze mit deutlich kleineren epidermoiden Zellen (2–5–7 × 3–5–10 µm; in 20 × 20 µm 9–14–23 Zellen), sich gegenseitig etwas überlappend und mit etwas stärker verquollenen Zellwänden (1–2 µm dick); Lactiferen 3–5–8 µm im Durchmesser.

Abziehende Hyphen selten.

Rhizomorphen (Abb. 4) 7–50–190 µm im Durchmesser, mit allen Übergangsformen von sehr dünnen, durchsichtigen, im Extremfall nur aus zwei parallelen Hyphen bestehend, bis zu dicken und schwach gefärbten Strängen aus kürzeren Hyphen mit leicht verquollenen Zellwänden (Type B/C, nach Agerer 1991); Hyphen, parallel ausgerichtet bis verwunden, meist fest verklebt, meist mit Milchsaft, häufig Anastomosen und gabelige bis knieförmige Verzweigungen bildend; Hyphen 2–3–5 µm im Durchmesser, Septenabstand 5–24–80 µm, Wände 0,5–1 µm dick. Septen oft mit zentralen, globulären Verdickungen. Enden der Rhizomorphen im Substrat pinselförmig in Einzelhyphen aufspaltend, diese sekundär oft wieder miteinander verschlungen.

Anatomie (Querschnitt):

Mantel (Abb. 5b, c) 10–20–30 µm dick, zweischichtig, pseudoparenchymatisch; äußere Schicht, 4–5–6 µm meist aus zwei Lagen tangential-ovaler bis abgeplatteter Zellen bestehend, diese tangential 5–8–12 µm, radial 1–2–3 µm, Zellwand 0,5–1 µm dick, durch amorphes Zellwandmaterial mehr oder weniger stark lichtbrechend, anschließende Schicht mit großlumigen, gleichmäßig verteilten Lactiferen, diese tangential 5–12–19 µm, radial 4–7–11 µm, übrige Hyphen tangential 4–5–7 µm, radial 2–3–4 µm, Wände bis 0,5 µm dick; Mantelinnenseite nicht deutlich abgesetzt, Lactiferen selten, Zellen kleinlumig, tangential 3–6–12 µm, radial 2–4–5 µm, Wände bis 0,5 µm dick.

Hartigsches Netz (Abb. 5b) einzellreihig, 2(–3) µm dick.

Cortexzellen (Abb. 5b) mit Hartigschem Netz: tangential 11–15–20 µm, radial 7–12–20 µm; CCq = 1,25.

Tanninzellen fehlend.

Anatomie (Längsschnitt):

Mantel: Merkmale und -abmessungen des medianen Längsschnittes jenen des Querschnitts entsprechend; Mantel der unmittelbaren Mykorrhizenspitze dünner, kaum differenziert.

Hartigsches Netz (Abb. 5a) in Aufsicht labyrinthisch-fächerförmig (Palmetti), Loben 2–3–5 µm breit; eine Wurzelzellschicht tief.

Cortexzellen (Abb. 5a) schräggestellt, tangential 15–18–27 µm, radial 28–40–50 µm; CCq = 0,45.

Farbreaktionen des Mantels mit verschiedenen Reagenzien:

Anilin: k.R. (= keine Reaktion); Brillantkresylblau: am Rand leicht violett; Baumwollblau/Milchsäure: k.R.; Ethanol 70%: k.R.; Eisensulfat: k.R.; Formol 40%: k.R.; Guaiak: schwach grau; KOH: schwach orange (die für frische Fruchtkörperstückchen charakteristische, kräftige Orangefärbung mit Kalilauge (MEIXNER 1975), fiel am Mykorrhizenmantel nur sehr schwach aus); Milchsäure: k.R.; Melzers Reagens: k.R.; Phenol: Lactiferen leicht gelblich; Phenol-Anilin: k.R.; Rutheniumrot: am Rand leicht rötlich; Saures Fuchsin: rosa bis rot; Lactiferen etwas kräftiger gefärbt; Sulfovanillin: Lactiferen dunkelviolett.

Autofluoreszenz:

Ganze Mykorrhizen: 254 nm: k.F. (= keine Fluoreszenz); 366 nm: k.F.
Schnittpräparate: UV-Filter (340–380 nm): äußerer, lichtbrechender Streifen auffallend heller als darunterliegende Zellagen; Blaufilter (450–490 nm): k.F.; Grünfilter (530–560 nm): k.F.

Kernfärbung (Karminessigsäure):

In den Rhizomorphen und in den Hyphen der Mantelinnenseite selten rundliche Paarkerne mit 0,8–1,2–1,6 µm Durchmesser im Abstand von 0–1,5–4 µm sichtbar.

Untersuchtes Material:

Referenzbeleg. – Außerdem folgendes Material: **Slowenien**. Krakovski Gozd, 16.7.1993, *GP 312* (M) – Krakovski Gozd, 23.9.1993, *GP 501 a, GP 502* Blindprobe und Krakovski Gozd, 15.6.94, *GP 901* (alle M).
Die Identifizierung erfolgte bei *GP 312, GP 501 a, GP 901* und beim Referenzbeleg durch Nachweis von Rhizomorphenverbindungen zwischen Mykorrhizen und Fruchtkörperbasis.

Lactarius serifluus DC.: Fr. an *Quercus robur* L.

Referenzbeleg: Slowenien, Krakovski Gozd, 23.9.1993, *Palfner*, *GP 507* (M).

Habitus (Abb. 6):

Kleine bis ziemlich große Systeme, bevorzugt in tieferen Bodenschichten unterhalb der Laubstreu; Verzweigung monopodial-pyramidal bis unregelmäßig verzweigt; unverzweigte Enden meist verbogen; Färbung gleichmäßig lebhaft orangebraun; Oberfläche glatt; kaum glänzend, oft mit anhaftenden Bodenpartikeln bedeckt; ohne auffälliges Lactiferennetz, silbrig reflektierende Milchröhrenabschnitte nur vereinzelt sichtbar; Rhizomorphen offenbar selten, dünn und glasig durchscheinend oder ziemlich dick und dann auffällig rotbraun pigmentiert. Achsen der Verzweigungssysteme 1–6–25 mm lang, 0,3–0,4 mm im Durchmesser; unverzweigte Enden bis 0,9(2,4) mm lang und 0,2–0,3 mm im Durchmesser.

Anatomie (Flächenansicht):

Mantel: Oberfläche (Abb. 7, 8a) mit einschichtigem, dem Mantel dicht anliegendem Netz aus dünnwandigen, schmal gelappten Zellen oder längeren Hyphen, einzelne Enden zuweilen tütenförmig spitz zulaufend; Mantelaußenseite angulär-pseudoparenchymatisch, in Spitzennähe auch abgerundet bis ausgebuchtet, Wände kaum verdickt, orangebraun; an der Mantelspitze kleinere Zellen, deren Wände oft wellenförmig miteinander verzahnt; mittlere Mantelschichten plectenchymatisch aus dünnen, undifferenzierten Hyphen und unterschiedlich dicken, verzweigten und kaum septierten Lactiferen; Zellwände farblos; Milchsaft frisch schwach orangegelblich, in Milchsäure zu Tröpfchen koagulierend; Mantelinnenseite unregelmäßig plectenchymatisch, mit eingestreuten pseudoparenchymatischen Stellen, Milchröhren selten; Zellwände farblos. Manteltyp P (nach AGERER 1991, 1995).
Dünnwandige Zellen und Hyphen der Manteloberfläche 3–7–13 µm im Durchmesser, mit Septen im Abstand von 27–35–55 µm, Wände bis 0,5 µm dick, Zellen der pseudoparenchymatischen Manteloberfläche 6–12–25 × 7–11–18 µm,

Anzahl der Zellen in 20 × 20 µm: 10–12–14, Zellwände 0,5–1 µm dick. Hyphen der plectenchymatischen mittleren Mantelschichten 3–5–6 µm dick, Lactiferen 3–6–10 µm im Durchmesser, Wände bis 0,5 µm dick. Hyphen der Mantelinnenseite 2–3–4 µm im Durchmesser, Wände bis 0,5 µm dick. Mantel der unmittelbaren Mykorrhizenspitze mit kleineren, 4–6–10 × 2–5–8 µm großen Zellen (Anzahl: 15–17–21 in 20 × 20 µm).

Abziehende Hyphen kaum nachweisbar.

Rhizomorphen (Abb. 8b, 9, 10c) selten, mit zwei entwicklungsbedingten Stadien (nach AGERER 1991, Typ B, mit oder ohne differenzierte Rinde): (a) Dünn und unpigmentiert, aus gestreckten, parallel verlaufenden, dünnwandigen Hyphen, diese teilweise mit Latex oder (b) sehr dick, außen aus gedrungenen bis rundlichen, teils blasig aufgetriebenen Zellen mit sehr dicken, orange- bis rotbraun gefärbten Zellwänden und zentralem Hyphenstrang, dieser wie einfache Rhizomorphe strukturiert, im Substrat in mehrere dünne, unberindete Stränge auffächernd; als besonderes Merkmal einzelne Hyphen im Rhizomorphenverband, sowohl an der Fruchtkörperstielbasis, als auch an der Mykorrhiza teilweise mit aufgetriebenen subapikalen oder medianen Verdickungen (Verzweigungsvorstufen?).

Dickere, pigmentierte ältere (?) Rhizomorphen 50–60–100 µm im Durchmesser, äußere Hyphen mit Zellen von 4–11–21 × 3–5–11 µm, und 0,5–1–4 µm dicken Wänden, dünnere, farblose, jüngere (?) Rhizomorphen 5–9–15 µm dick, Hyphen dieser Rhizomorphen wie jene im zentralen Bereich des dickeren Stadiums 2–3 µm im Durchmesser, mit Septenabständen von 5–58–110 µm und Wänden bis 0,5 µm dick.

Anatomie (Querschnitt):

Mantel (Abb. 10b) 10–25–40 µm dick, zweischichtig, pseudoparenchymatisch; Manteloberfläche teilweise mit dünnwandigen Zellen des Oberflächennetzes bedeckt, Enden sehr selten cystidenartig abstehend; äußere Mantelschicht aus relativ großen, abgeplatteten, breiten, polygonalen oder ovalen Zellen bestehend, tangential 5–10–23 µm, radial 2–4–6 µm, Zellwände 0,5–1 µm dick, orangebraun; anschließende Schicht mit deutlich kleinerlumigen Zellen, tangential 2–5–10 µm, radial 3–4–7 µm, mit eingestreuten, dickeren Milchröhrenanschnitten, tangential 2–5–15 µm, radial 3–4–8 µm, Zellwände bis 0,5 µm, farblos; Mantelinnenseite nicht auffällig abgesetzt, aus kleinen Zellen bestehend, tangential 3–5–10 µm, radial 2–4–5 µm, Lactiferen selten, Wände bis 0,5 µm, innerste Zellen häufig von braunen Wurzelzellwandresten umgeben.

Hartigsches Netz (Abb. 10b) einzellreihig, gerade bis leicht perlschnurartig, 2–3 µm dick.

Cortexzellen (Abb. 10b) mit Hartigschem Netz: tangential 12–15–19 µm, radial 10–14–28 µm; CCq = 1,07.

Anatomie (Längsschnitt):

Mantel: Merkmale und -abmessungen wie im Querschnitt, Mantel der unmittelbaren Mykorrhizenspitze dünner, kaum differenziert.

Hartigsches Netz (Abb. 10d) in Aufsicht labyrinthisch-fächerförmig (= Palmetti), Loben 2–3–5 µm breit; eine Wurzelzellschicht tief.

Cortexzellen (Abb. 10a) mit Hartigschem Netz: schräggestellt, tangential 5–10–20 µm, radial 35–47–55 µm; CCq = 0,18.

Farbreaktionen des Mantels mit verschiedenen Reagenzien:

Anilin: k.R. (= keine Reaktion); Brillantkresylblau: k.R.; nur Rand leicht bläulich; Baumwollblau/Milchsäure: k.R.; Ethanol 70%: k.R.; Eisensulfat: Lactiferen z.T. oliv-

graugrün; Formol 40%: k.R.; Guaiak: nur Latextröpfchen graublau; KOH: k.R.; Milchsäure: k.R.; Melzers Reagens: k.R.; Phenol: k.R.; Phenolanilin: k.R.; Ruthenium rot: k.R.; Safranin : gleichmäßig tiefrot; Saures Fuchsin: gleichmäßig rosa bis lila; Sulfovanillin: Lactiferen weinrot bis violett; Mantel gelblich.

Autofluoreszenz:

Ganze Mykorrhiza: 254 nm: k.F. (= keine Fluoreszenz); 366 nm: k.F.
Schnittpräparate: UV-Filter (340–380 nm): k.F.; mit Blaufilter (450–490 nm): äußere Mantelschicht orangebraun, innere fahl gelbgrün; Grünfilter (530–560 nm): k.F.

Kernfärbung (Karminessigsäure):

Hyphen der Mantelinnenseite vereinzelt mit dicht beieinanderliegenden, rundlichen Paarkernen, Durchmesser: 1,2–1,5–2 µm, Abstand: 0–1,3–7 µm.

Untersuchtes Material:

Referenzbeleg. – Außerdem folgendes Material: **Slowenien,** Krakovski Gozd, 23.9.1993, *GP 506 b* (Blindprobe) (M).
Nur Referenzbeleg identifiziert; zwar wurden keine Rhizomorphenverbindungen zwischen Mykorrhizen und Fruchtkörper gefunden, doch ist die Zugehörigkeit weitestgehend abgesichert, da unter drei Fruchtkörpern jeweils die gleichen Mykorrhizen auftraten und zudem die Rhizomorphenmerkmale der Mykorrhizen und Fruchtkörper übereinstimmten.

Diskussion

Eine kurze Beschreibung der Ektomykorrhizen von *Lactarius chrysorrheus* stammt von LUPPI und GAUTERO (1967). Sie geben die Farbe der ganzen Mykorrhizen mit „haselnußfarben an der Basis, cremefarben an der Spitze“ an und beschreiben u.a. auch den im Schnitt pseudoparenchymatischen Mantel mit einem lichtbrechenden Streifen als äußerem Abschluß, der ihrer Meinung nach aus Schleimstoffen besteht. Ebenso erwähnen sie die deutlich sichtbaren Lactiferen, deren Inhalt mit Lugolscher Lösung blaugrün färbbar sein soll. PEYRONEL (1963) schreibt, daß Mykorrhizen von *L. chrysorrheus* bei Verletzung von Weiß nach Orangegelb verfärbenden Milchsaft absondern, wobei hier eine solche Verfärbung allerdings nicht immer beobachtet werden konnte.

Eine ausführliche Beschreibung der Mykorrhiza von *Lactarius serifluus* existiert bisher nicht, die Art wurde aber von CERUTI et al. (1985) als Mykorrhizabildner mit *Castanea sativa* aufgeführt.

Fast alle bislang bezüglich ihrer Ektomykorrhizen untersuchten Arten von *Lactarius* sect. *Lactarius* bilden ockerfarbene bis hellbraune, teils rosa oder fleischfarben überhauchte Mäntel mit epidermoider Manteloberfläche und dichtem, meist deulich hervortretendem Milchröhrennetz, sowie relativ häufigen Rhizomorphen (*Lactarius pallidus* Pers.: Fr. (BRAND 1991); *Lactarius blennius* Fr. (BRAND 1991); *Lactarius chrysorrheus*: s. vorliegende Studie). Eine Ausnahme bildet *L. porninsis* Roll. (TREU 1990). Diese Art ist gekennzeichnet durch orange gefärbte, plectenchymatische, nicht weiter differenzierte Mykorrhizenmäntel und zeigt damit Ähnlichkeiten zu den bisher untersuchten Arten von *Lactarius* sect. *Dapetes* (vgl. AGERER 1995).

Von der habituell sehr ähnlichen Mykorrhiza von *L. blennius* (BRAND 1991) unterscheidet sich *L. chrysorrheus* durch die mehr fleischfarbene Tönung, die nur schwach verdickten Wände der epidermoiden Mantelzellen, die teilweise gelbbräunlich gefärbten Rhizomorphen, den mit Sulfovanillin färbbaren Lactifereninhalt und das im Querschnitt nicht blasig aufgetriebene Hartigsche Netz.

Von *Lactarius pallidus* läßt sich *L. chrysorrheus* trennen durch seine wesentlich dünnerwandigen Zellen der äußeren Mantelschichten, durch die pigmentierten Rhizomorphen (farblos-hyalin in *L. pallidus*), durch die einheitlich gefärbte Manteloberfläche (*L. pallidus* mit stellenweise auftretenden, ockerfarbenen Flecken). Außerdem kommen die Mykorrhizen von *L. pallidus* im Gegensatz zu jenen von *L. chrysorrheus* bevorzugt in tieferen Bodenschichten vor.

Die bisher studierten Ektomykorrhizen aus *Lactarius* sect. *Russulares* haben, anders als die meisten Mykorrhizen von *Lactarius* sect. *Lactarius*, lebhaft orangebraun gefärbte Mäntel und kein farblich deutlich von der Oberfläche abstechendes Lactiferennetz (Ausnahmen s. unten), Rhizomorphen sind durchwegs selten oder fehlen offenbar ganz. Ein deutlich hervorstechendes Lactiferennetz zeigen die Mykorrhizen von *Lactarius subdulcis* (Bull.: Fr.) S.F.Gray (BRAND & AGERER 1986), sowie *L. rubrocinctus* Fr. (BRAND 1991). Da beide Ektomykorrhizen jedoch konstant mit einem Ascomyceten vergesellschaftet sind (BRAND & AGERER 1986, BRAND 1991, 1992), die ihre Hyphen in den Mänteln der beiden Ektomykorrhizen wachsen lassen und Hypertrophien verursachen, könnte das auffällige Lactiferennetz durch diese besonderen Bedingungen hervorgerufen worden sein.

Neben *Lactarius subdulcis*, *L. rubrocinctus* und *L. serifluus* sind folgende Arten aus dieser Sektion bezüglich ihrer Mykorrhizen bekannt: *L. badiosanguineus* Kühn. & Romagn. (TREU 1990), *L. camphoratus* (BRAND 1991), *L. decipiens* Quél. (GRONBACH 1988), *L. mitissimus* (WEISS 1991), *L. theiogalus* (Bull.: Fr.) S.F.Gray (GRONBACH 1988) und *L. alpinus* Peck (TREU 1990). Nur *L. alpinus* zeigt in Mantelaufsicht epidermoide Zellen. Für alle übrigen Arten sind eckige Zellen typisch, denen noch ein feines Hyphennetz aufgelagert ist (AGERER 1995).

Ein morphologischer Vergleich dieser Arten ist kaum möglich, da diese Ektomykorrhizen von verschiedenen Baumgattungen beschrieben worden sind (*Fagus*, *Picea*, *Pinus*, *Quercus*) und der Wirt teilweise gravierenden Einfluß auf die äußere Gestalt nimmt (AGERER 1995). Anatomische, pilzeigene Merkmale des Mantels und der Rhizomorphen können jedoch für eine Gegenüberstellung der Arten herangezogen werden.

Lactarius serifluus sondert nach Verletzung frischer Ektomykorrhizen keinen auffälligen Milchsaft ab, dies im Gegensatz zu allen übrigen genannten Arten. Ebenso bildet offenbar nur diese Art Rhizomorphen mit kurzen, gedrungenen und recht dickwandigen Zellen als äußere Begrenzung, sowie einzelne Hyphen mit subapikalen oder mehr mittig gelegenen Verdickungen. Am untersuchten Material von *L. serifluus* konnten keine Fremdpilzinfektionen nachgewiesen werden, während dies für *L. subdulcis* und *L. rubrocinctus* ein konstantes Merkmal darstellt (s.o.).

Die nur an *Alnus*-Arten vorkommenden Ektomykorrhizen von *L. alpinus* kann schon an der epidermoiden Manteloberfläche erkannt werden, ist gelblich und besitzt sehr dünne Lactiferen. *Lactarius serifluus* kann, allerdings eher in Spitzennähe, auch ausgebuchtete Zellen bilden.

Die Mykorrhizen von *L. decipiens*, *L. mitissimus*, *L. badiosanguineus* und *L. thejogalus* sind nur von Nadelbäumen her bekannt und werden deshalb nicht weiter mit jenen von *L. serifluus* verglichen.

Lactarius camphoratus-Mykorrhizen – von *Fagus sylvatica* und *Picea abies* bekannt (BRAND 1991) – scheiden bei Verletzung auffälligen Milchsaft aus und

besitzen einfacher gebaute Rhizomorphen; kurzgliedrige Zellen treten an der Rhizomorphenoberfläche nicht auf.

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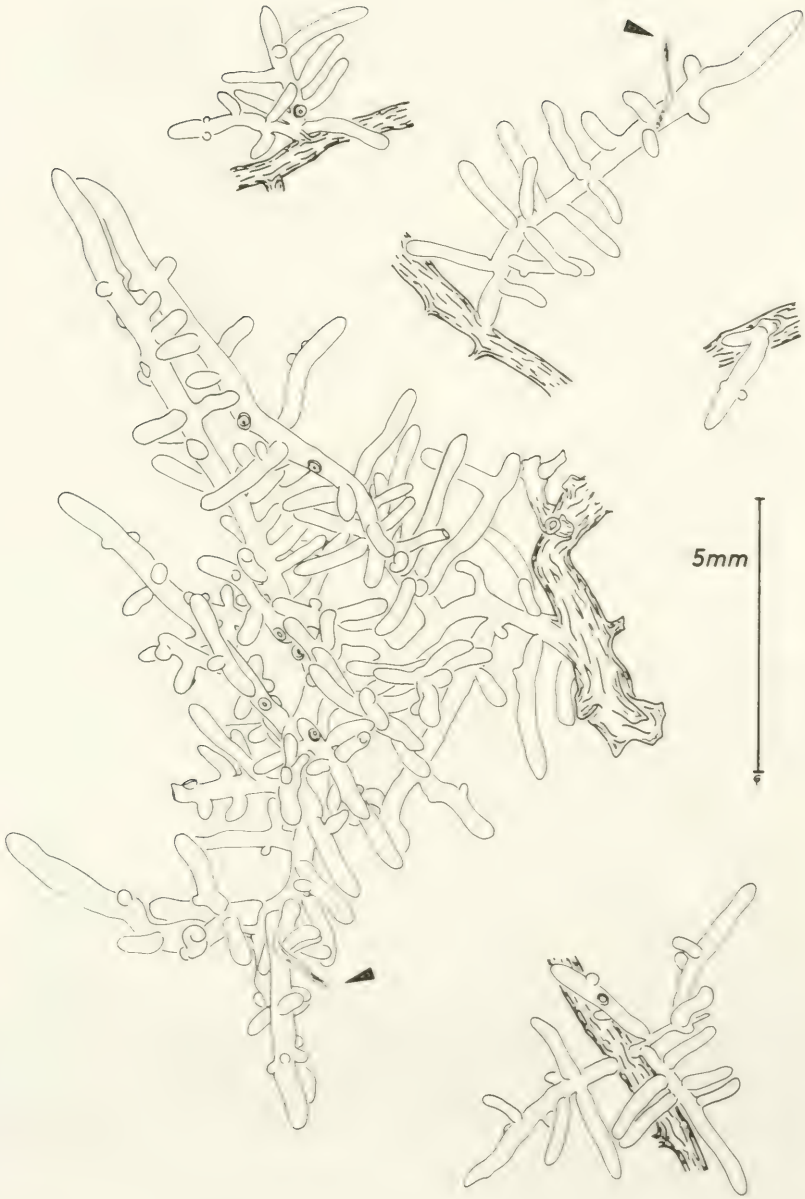

Abb. 1: *Lactarius chrysorrheus*; Mykorrhizen in unterschiedlichen Wachstumsstadien; die Pfeilköpfe bezeichnen Ansatzstellen von Rhizomorphen. – Alle Abb. von *GP 501 a*.

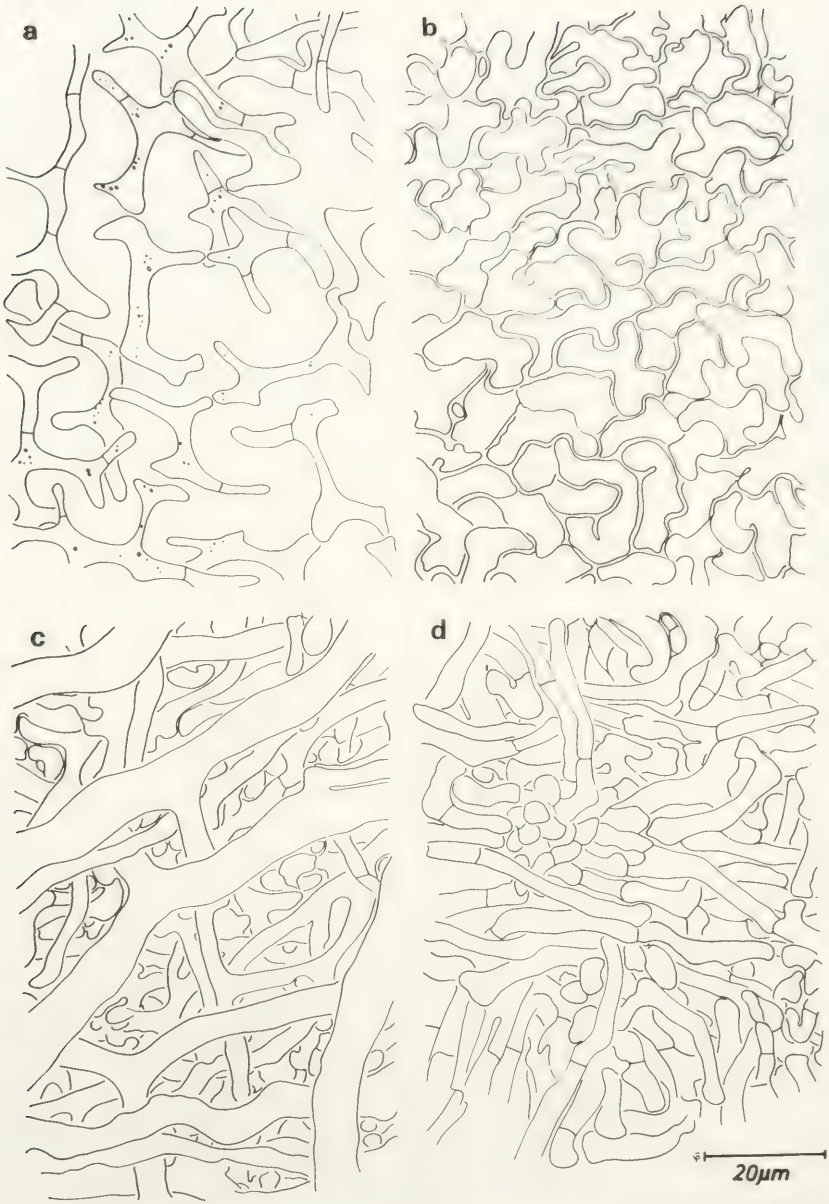

Abb. 2: *Lactarius chrysorrheus*; Mantel in Aufsicht. – a: Manteloberfläche: dünnes, enganliegendes Hyphennetz im Spitzenbereich. – b: Mantelaußenseite: epidermoide bis gelappte Zellen mit leicht aufgequollenen Zellwänden. – c: mittlere Mantelschicht: plectenchymatisch mit verzweigten Lactiferen. – d: Mantelinnenseite: Plectenchym ohne Lactiferen. – Abb. a, d von *GP 502*, Abb. b, c von *GP 111*.

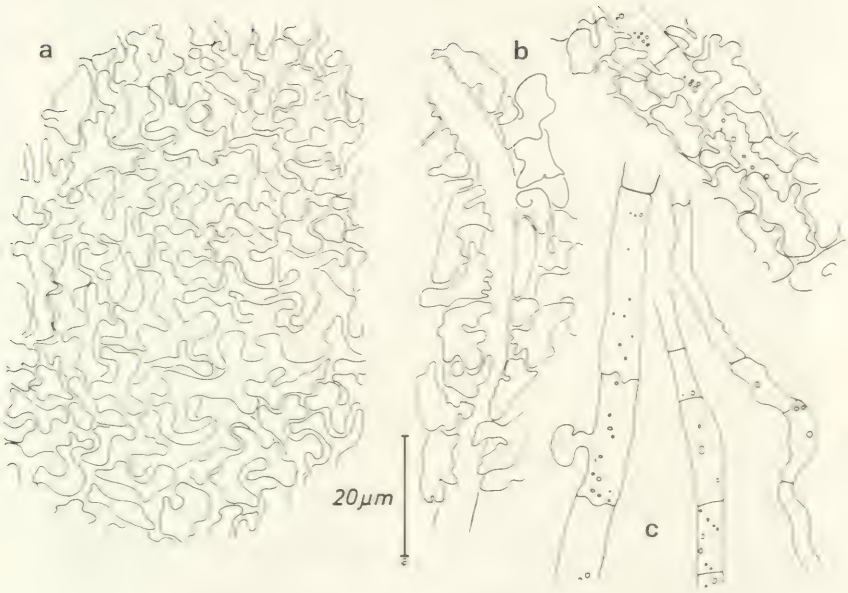

Abb.3: *Lactarius chrysorrheus*; Details der Mantelspitze. – a: Manteloberfläche: meist kleine, stark gelappte, teils übereinandergeschobene Zellen mit aufgequollenen Zellwänden. – b: direkt an der Manteloberfläche verlaufende Lactiferen, von angrenzenden Mantelzellen „pseudopodienartig" umgriffen. – c: Lactiferen der unmittelbaren Mantelspitze, kurz septiert, ohne angrenzende Zellen gezeichnet. – Abb. a, b von *GP 502*, c von *GP 111*.

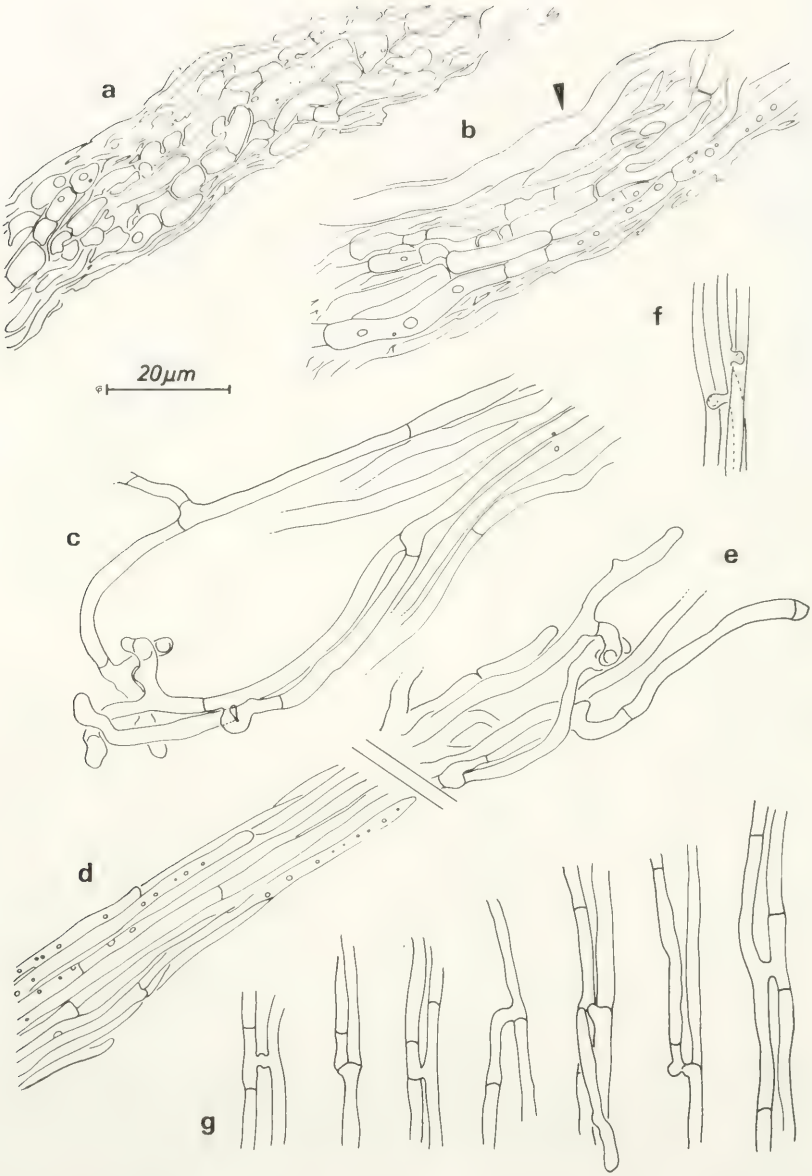

Abb. 4: *Lactarius chrysorrheus*; Rhizomorphenstrukturen. – a: dickere, leicht pigmentierte Rhizomorphe, Oberfläche aus kurzen Hyphen mit leicht aufgequollenen Zellwänden und Latextröpfchen. – b: dieselbe Rhizomorphe im optischen Längsschnitt: etwas längere, dünnwandige Hyphen und „mitlaufende" Fremdhyphe (Pfeilkopf) – c: Rhizomorphenende mit Schlinge. – d: Rhizomorphe, Hyphen mit Latextröpfchen. – e: pinselförmig aufgefächertes Ende derselben Rhizomorphe im Substrat, auch hier Schlingenbildung erkennbar. – f, g: verschiedene Verzweigungs- und Anastomosenformen in Rhizomorphen. – Alle Abb. von *GP 501a*.

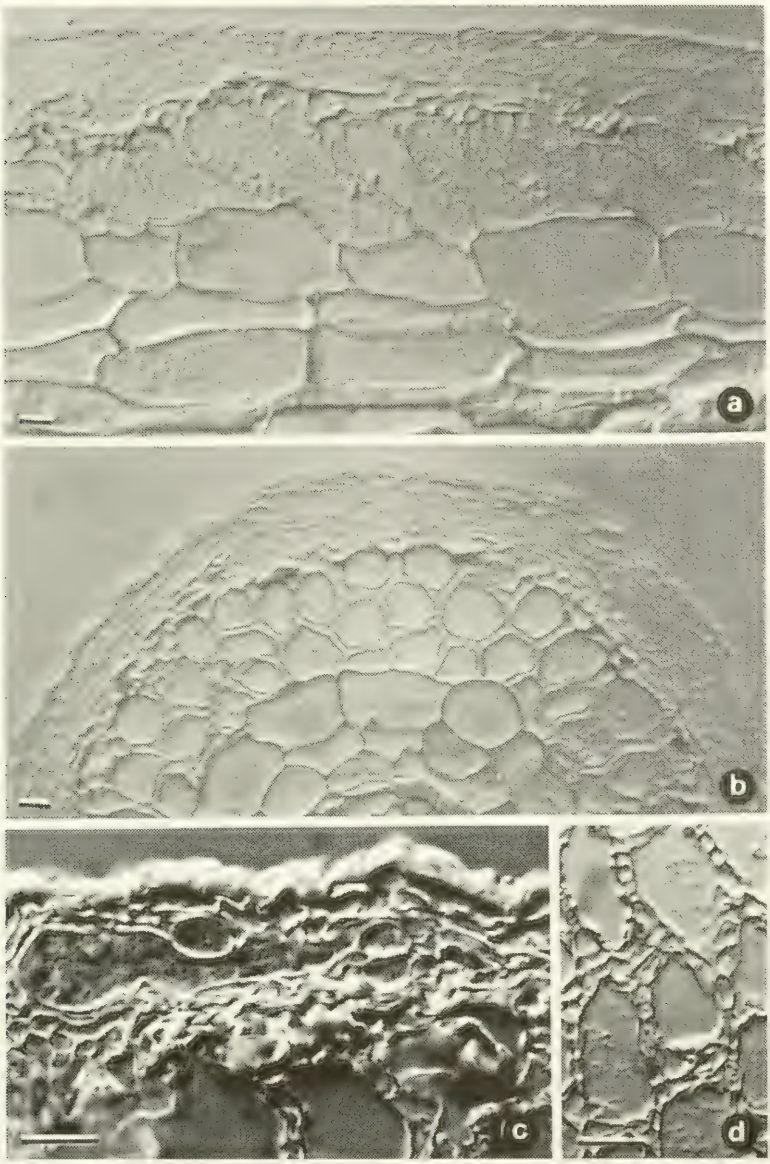

Abb. 5: *Lactarius chrysorrheus*. – a: Längsschnitt: Mantel, Hartigsches Netz nur eine Rindenzellschicht tief. – b: Querschnitt: Mantel im inneren Bereich mit Calyptra-Derivaten, Hartigsches Netz scheinbar (s. Längsschnitt unter 'a') mehrere Rindenzellschichten umfassend. – c: Querschnitt: äußere Hyphen des Mantels mit stark verquollenen Zellwänden, Mantel mit Lactifere. – d: Tangentialschnitt durch Hartigsches Netz. – Abb. c–d von *GP 111*. – Meßbalken entsprechen 10 µm.

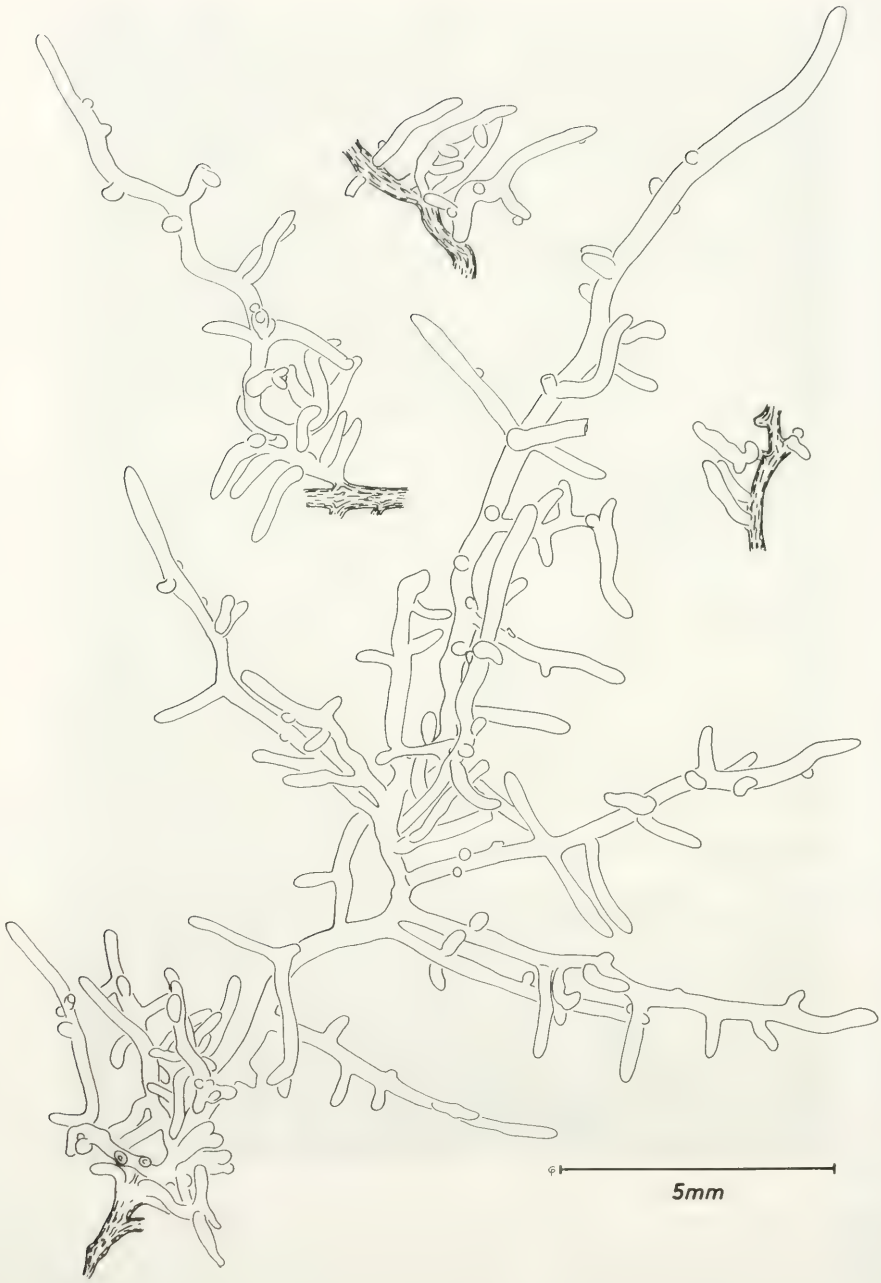

Abb. 6: *Lactarius serifluus*; Mykorrhizen in verschiedenen Wachstumstadien. – Alle Abb. von *GP 507*.

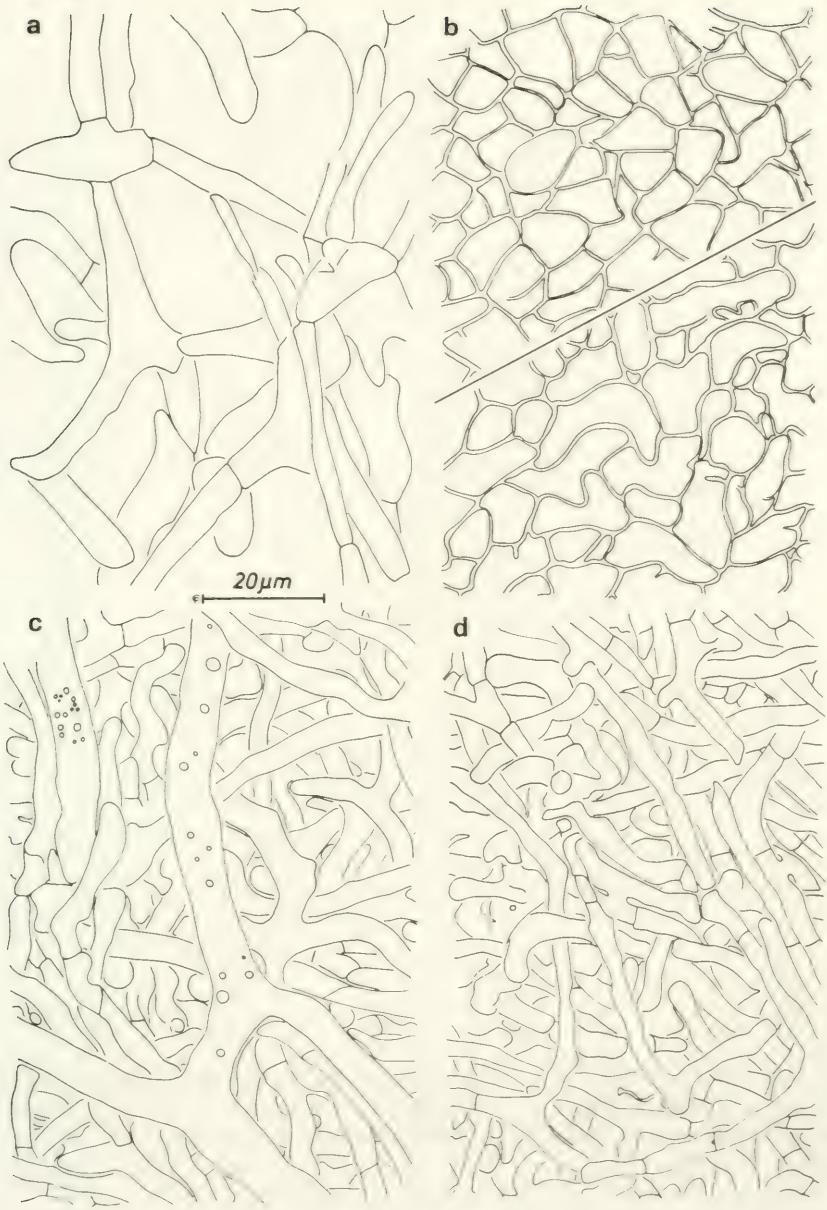

Abb. 7: *Lactarius serifluus*; Mantel in Aufsicht. – a: Manteloberfläche: enganliegendes, dünnwandiges Hyphennetz. – b: Mantelaußenseite, oben: anguläre Zellen in basaleren Bereichen; darunter: abgerundete bis ausgebuchtete Zellen in Spitzennähe, Zellwände leicht verdickt. – c: mittlere Mantelschichten: Plectenchym mit verzweigten Lactiferen, teilweise mit Latextröpfchen. – d: Mantelinnenseite: einfaches Plectenchym, Hyphen teilweise anastomosierend. – Alle Abb. von *GP 507*.

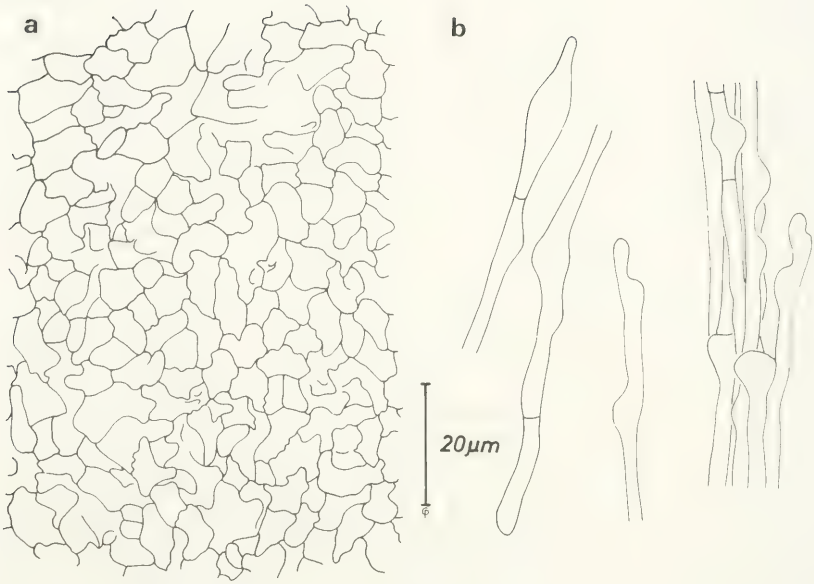

Abb. 8: *Lactarius serifluus*. – a: Mantelspitze: Zellen der Mantelaußenseite klein, dünnwandig, Zellwände teilweise wellenförmig verzahnt. – b: Rhizomorphendetails der Fruchtkörperbasis: auffällig verdickte Hyphenabschnitte (vgl. Abb. 9a, c). – Alle Abb. *GP 507*.

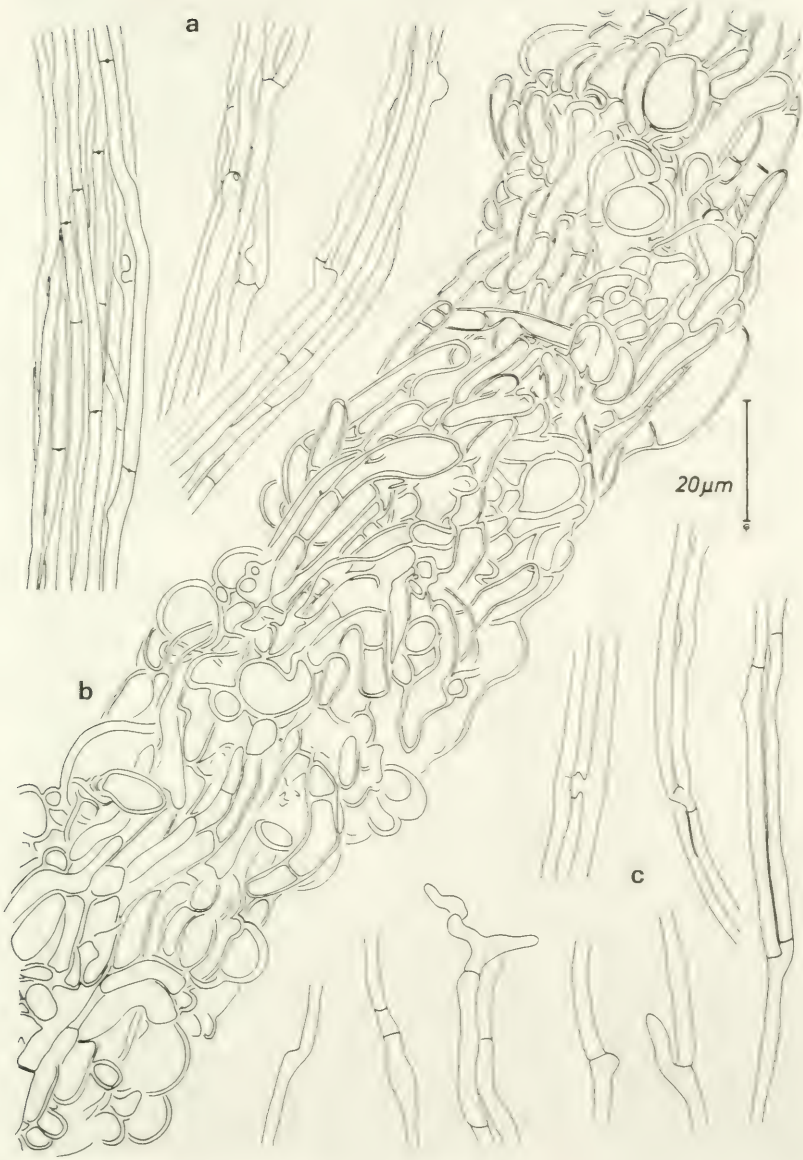

Abb. 9: *Lactarius serifluus*, Rhizomorphen. – a: undifferenzierte Rhizomorphen, Einzelhyphen teilweise mit charakteristischen Verdickungen. – b: differenzierte Rhizomorphe, äußere Rinde in Aufsicht. – c: Anastomose, Hyphenformen und Verzweigungen in Rhizomorphen. – Alle Abb. *GP 507*.

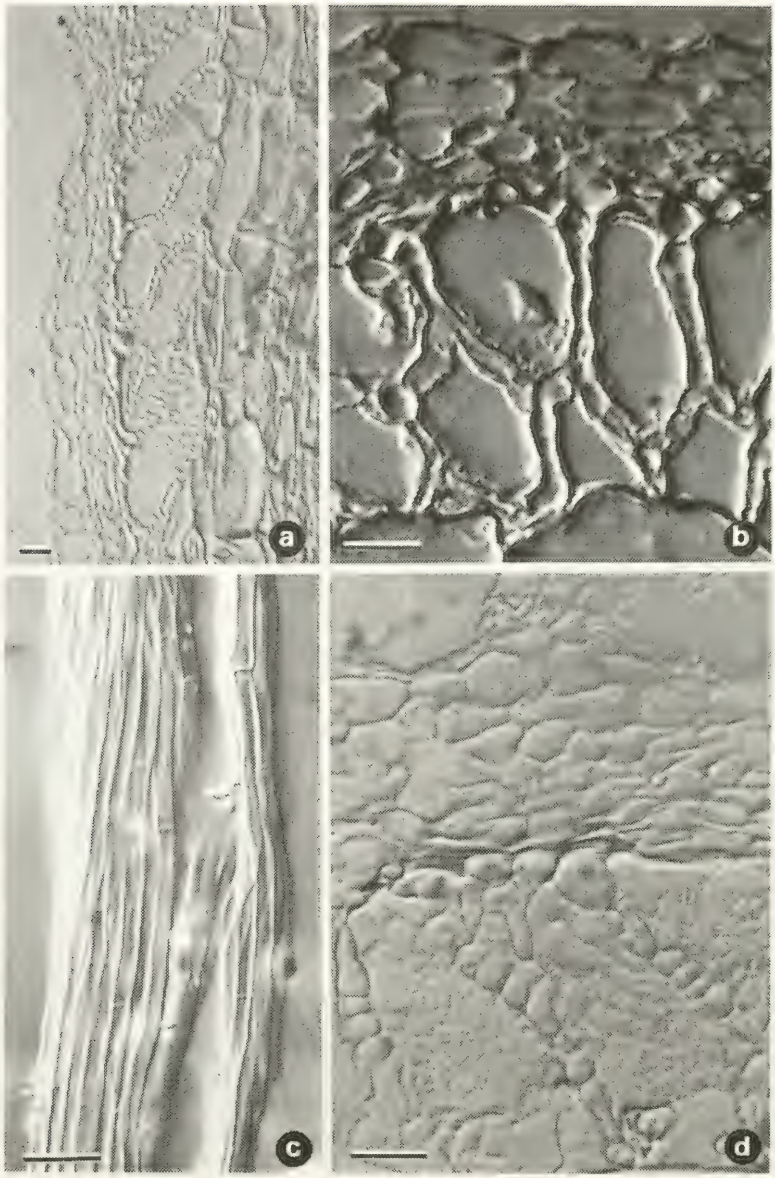

Abb. 10: *Lactarius serifluus*. – a. Längsschnitt: Mantel, Hartigsches Netz darunter nur eine Rindenzellschicht tief. – b. Querschnitt: Mantel, Hartigsches Netz darunter scheinbar mehrere Rindenzellschichten umfassend (s. Längsschnitt unter 'a'). – c: Rhizomorphe. – d. Längsschnitt: Mantel, Hartigsches Netz z.T. in Aufsicht. – Alle Abb. von *GP 507*. – Meßbalken entsprechen 10 µm.

„Quercirhiza squamosa“ eine nichtidentifizierte Ektomykorrhiza an Quercus robur*

G. PALFNER & R. AGERER

Zusammenfassung:
PALFNER, G. & AGERER, R.: „Quercirhiza squamosa“, eine nichtidentifizierte Ektomykorrhiza an Quercus robur. – Sendtnera 3: 137–145. 1996. – ISSN 0944–0178.

Die Ektomykorrhiza „*Quercirhiza squamosa*“ wird als neue Art beschrieben und mit anderen dunkelbraunen Mykorrhizen an *Quercus robur*, *Fagus sylvatica* und *Picea abies* verglichen.

Abstract:
The ectomycorrhiza "*Quercirhiza squamosa*" is described as a new species and compared with other dark brown ectomycorrhizae known from *Quercus robur*, *Fagus sylvatica* and *Picea abies*.

Einleitung

Bei Mykorrhizenanalysen im Boden fallen immer wieder dunkelbraune Ektomykorrhizen auf, die bislang keiner Pilzart zugeordnet werden können. Obwohl morphologisch sehr ähnlich, lassen sich doch deutliche, anatomische Unterschiede zwischen solchen Mykorrhizen nachweisen. Mit „*Q. squamosa*“ wird eine weitere Art, die zweite an *Quercus robur*, vorgestellt.

Methoden zur Isolierung der Ektomykorrhizen aus dem Boden, zur Vorgehensweise bei der Analyse, sowie wichtige Merkmale wurden bereits zusammengefaßt (AGERER 1991), die verwendeten Termini sind in einem Glossar erklärt (AGERER 1987–1994). Für die vorliegenden Beschreibungen von Schnitten wurde in Historesin eingebettetes Material verwendet (AGERER 1991). Zur Ermittlung des CCq (AGERER 1987–1994) wurden die Längenmaße der äußeren, vom Hartigschen Netz umgebenen Rindenzellen im medianen Längsschnitt nicht streng radial, sondern entlang ihrer geneigten Längsachse gemessen. Die unterstrichenen Werte sind Mittelwerte aus zumindest fünfzehn Messungen; Minimal- und Maximalwerte sind beigegeben.

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* Gilt als Studien an Ektomykorrhizen LVII.

„*Quercirhiza squamosa*“ an *Quercus robur* L.

Referenzbeleg: **Slowenien**. Krakovski Gozd, 23.9.1993, *Palfner GP 501 b* (M).
Habitus (Abb. 1a):

Mykorrhizen bevorzugt in lockerer Laubstreu, aber auch in tieferen Bodenlagen; Systeme klein, kaum verzweigt bis mittelgroß und dicht verzweigt; meist monopodial-pyramidal, teilweise auch unregelmäßig verzweigt; unverzweigte Enden gerade bis schwach gekrümmt; stets einheitlich schwarzbraun, mit rötlichem Glanz; Oberfläche körnig-rauh, bei guter Beleuchtung glimmerig-metallisch glänzend; meist umgeben von kräftigen, gerade bis gewunden abstehenden Hyphen, teilweise von diesen filzig eingehüllt; Rhizomorphen fehlen.

Achsen der Verzweigungssysteme 1,7–3,8–7 mm lang, 0,2–0,4–0,5 mm im Durchmesser, unverzweigte Enden bis 1(2,4) mm lang und 0,3(0,4) mm im Durchmesser.

Anatomie (Flächenansicht):

Mantel (Abb. 1b, 2a–d): Oberfläche ziemlich gleichmäßig mit dunkelbraunen bis schwarzbraunen, je nach Dicke mehr oder weniger durchsichtigen Schuppen oder Plättchen aus dickwandigen Resten abgestorbener Mantelzellen bedeckt; diese bereits mit mittlerer Vergrößerung deutlich sichtbar, im Spitzenbereich verdichtet, Mantel hier fast undurchsichtig.

Zellhaufen der Oberfläche 20–55–80 × 12–38–60 µm groß. Manteloberfläche pseudoparenchymatisch, mit angulären Zellen mit meist abgerundeten Ecken, auch ausgebuchtet, oft sehr groß (8–16–26 × 7–10–15 µm), Zellwände 1–2–4 µm, dunkelbraun, 4–6–9 Zellen in 20 × 20 µm; darunter liegende Schichten aus kleineren (4–9–15 × 4–6–10 µm), dünnerwandigen (0,5–1 µm), polygonalen Zellen bestehend; mittlere Mantelschichten zur Wurzel hin allmählich plectenchymatisch, aus langgestreckten, teilweise anastomosierenden Hyphen und gedrungenen oder rundlichen Elementen zusammengesetzt; Mantelinnenseite unregelmäßig plectenchymatisch, stellenweise fast pseudoparenchymatisch aus Nestern rundlicher Zellen, Hyphen 2–5–15 µm im Durchmesser, Septenabstand 3–13–25 µm, Zellwände stets braun, bis 0,5 µm dick. Unmittelbare Mykorrhizenspitze mit kleinerzelligem Pseudoparenchym bis 15 Zellen pro 20 × 20 µm. Manteltyp O (nach AGERER 1991, 1995).

Abziehende Hyphen (Abb. 3) häufig, 3–5–6 µm im Durchmesser, Wände 0,5–1–1,5 µm dick, Septenabstand 4–58–146 µm, aus Basiszellen in der äußersten Mantelschicht, z.T. auch aus den aufgelagerten Zellhaufen hervorgehend; Verzweigungen häufig, oft rechtwinklig; mit dicken, bernsteinfarben bis rotbraun gefärbten Zellwänden, diese meist glatt, seltener warzig inkrustiert, dann meist in größerer Entfernung von der Manteloberfläche; im Wachstum befindliche Spitzen meist blaßbraun bis farblos, vielgestaltig: verzweigt, geschlängelt oder sich gegenseitig umwindend; Septen, zumindest teilweise mit Schnallen, häufig einfache Septen mit Schnallen abwechselnd; intrahyphale Hyphen konnten nicht gefunden werden.

Rhizomorphen fehlend.

Anatomie (Querschnitt):

Mantel (Abb. 4a, b) 15–30–40 µm dick, zweischichtig, pseudoparenchymatisch, mit aufliegenden, abgestorbenen, flachgedrückten bis kollabierten, dickwandigen Zellen, Zellhaufen 4–7–12 µm, größere Zellhaufen sich vom Rand her abschälend; Mantelaußenseite aus großlumigen, abgeflachten Zellen bestehend, tangential 5–11–35 µm, radial 3–5–7 µm, sehr dickwandig (1–2 µm); Zellen des mittleren Mantelbereiches kleiner, tangential 3–9–20 µm, radial 3–4–9 µm, Zellwände nur mäßig

verdickt (bis 0,5 µm); Mantelinnenseite kleinzellig, nicht auffallend abgesetzt, tangential 2–5–10 µm, radial 2–4–10 µm, Wände bis 0,5 µm dick, Zellen meist von braunen Wurzelzellwandresten umgeben.

Hartigsches Netz (Abb. 4b) einzellreihig, meist gerade, 2–3 µm dick.

Cortexzellen (Abb. 4b) mit Hartigschem Netz: tangential 5–12–17 µm, radial 6–11–15 µm; CCq = 1,10.

Anatomie (Längsschnitt):

Mantel: Merkmale und -abmessungen im wesentlichen dem Querschnitt entsprechend; Mantel der unmittelbaren Mykorrhizenspitze nicht auffällig anders.

Hartigsches Netz in Aufsicht labyrinthisch fächerförmig (= Palmetti), Loben 2–3–5 µm breit; eine Wurzelzellschicht tief.

Cortexzellen mit Hartigschem Netz (Abb. 4c): radial verlängert, schräg nach vorne außen orientiert, tangential 6–10–20 µm, radial 35–52–65 µm, CCq = 0,20.

Farbreaktionen des Mantels mit verschiedenen Reagenzien:

Anilin: k.R. (= keine Reaktion); Brillantkresylblau: k.R.; Baumwollblau/Milchsäure: schwach pigmentierte Spitzen einzelner abziehender Hyphen blau; Ethanol 70%: k.R.; Eisensulfat: k.R.; Formol 40%: k.R.; Guaiak: k.R.; KOH: k.R.; Milchsäure: k.R.; Melzers Reagens: k.R.; Phenol: k.R.; Phenol-Anilin: k.R.; Rutheniumrot: k.R.; Safranin : k.R.; Saures Fuchsin: k.R.; Sulfovanillin: k.R.

Autofluoreszenz:

Ganze Mykorrhiza: 254 nm: k.F. (= keine Fluoreszenz); 366 nm: k.F.;

Schnittpräparate: UV-Filter (340–380 nm): k.F.; Blaufilter (450–490 nm): k.F.; Grünfilter (530–560 nm): k.F.

Kernfärbung (Karminessigsäure):

Kerne sehr schlecht zu erkennen, vereinzelt rundliche bis ovale, dicht beieinander liegende Paarkerne in den abziehenden Hyphen. Durchmesser: 0,8–1,1–1,6 µm, Abstand: 0–0,8 µm.

Untersuchtes Material:

Referenzbeleg.

Diskussion

Die charakteristische Merkmalskombination von „*Quercirhiza squamosa*“ (Pseudoparenchym aus angulären, außen sehr dickwandigen Zellen, undurchsichtige, meist mehrschichte Schuppen aus Mantelzellresten, abziehende Hyphen mit Schnallen, keine Cystiden) wird am ehesten von „*Piceirhiza nigra*“ (an *Picea abies*, GRONBACH 1988) erreicht, doch hat diese weniger stark verdickte Zellwände der oberen Mantelschicht, die Zellhaufen bestehen aus rundlichen, zumindest äußerlich noch intakten Zellen und neben den abziehenden Hyphen sind, wenn auch nur vereinzelt, Cystiden vorhanden. Auch die, ebenfalls sehr ähnliche „*Piceirhiza obscura*“ (an *Picea abies,* GRONBACH 1988) trägt vereinzelt Cystiden, hat vor allem, trotz sehr ähnlicher Zellrestschuppen wie bei „*Q. squamosa*“, keine Schnallen an den

Septen der abziehenden Hyphen und außerdem einen an der Oberfläche aus epidermoid-gelappten Zellen bestehenden Mantel.

BRAND (1991) beschreibt ausführlich drei Mykorrhizen an Rotbuche („*Fagirhiza setifera*", „*Fagirhiza spinulosa*" und „*Fagirhiza fusca*"), die sich aufgrund ihres makroskopischen Erscheinungsbildes ebenfalls zwanglos in die hier charakterisierte Gruppe einfügen: Alle drei Arten sind dunkel- bis schwarzbraun, haben abziehende Hyphen mit Schnallen und in Aufsicht angulär-pseudoparenchymatische Mäntel. Hauptunterscheidungsmerkmale gegenüber „*Q. squamosa*" ist das Fehlen von Zellanhäufungen auf der Manteloberfläche, stattdessen finden sich bei allen drei Arten einzelne, blasig oder höckerig aus der Oberfläche hervorragende Zellen mit dicken Wänden. Zusätzlich treten bei „*F. setifera*" Seten, bei „*F. spinulosa*" flaschenförmige Cystiden auf, die bei „*Q. squamosa*" fehlen. „*F. fusca*" hat zwar ebenfalls keine Seten oder Cystiden, unterscheidet sich aber außer durch das bereits erwähnte Fehlen von Zellhaufen deutlich von „*Q. squamosa*" durch die insgesamt heller braune Färbung und die, zumindest teilweise dünnen, gelblich braunen abziehenden Hyphen. Sie umhüllen die Mykorrhiza eher wollig als sparrig-filzig, wie dies bei „*Q. squamosa*" der Fall ist. Die von UHL (1988) beschriebene „*Q. atrata*" besitzt keine Schnallen.

Über die systematische Stellung des Pilzpartners von „*Q. squamosa*" können nur Vermutungen angestellt werden. Fest steht aufgrund der stets vorhandenen Schnallen nur, daß er unter den Basidiomyceten zu suchen ist. Inzwischen wurde von AGERER et al. (1995) nachgewiesen, daß „*P. nigra*" die bislang ähnlichste Art, von einem Vertreter der Familie Thelephoraceae gebildet wird. Dies vermutete bereits GRONBACH anhand eines Vergleichs zwischen einer, von DANIELSON et al. (1984) synthetisierten *Tomentella*-Mykorrhiza und „*P. nigra*". Berücksichtigt man wiederum die große Ähnlichkeit von „*Q. squamosa*" mit „*P. nigra*", so liegt die Vermutung nahe, daß auch die hier beschriebene Art von einem Pilz der Familie Thelephoraceae gebildet wird. Eine Grünfärbung an den abziehenden Hyphen mit Kalilauge, wie sie z.B. für manche *Tomentella*-Arten typisch ist (DANIELSON et al. 1984, JÜLICH 1984, BREITENBACH & KRÄNZLIN 1986), war jedoch nicht zu erzielen.

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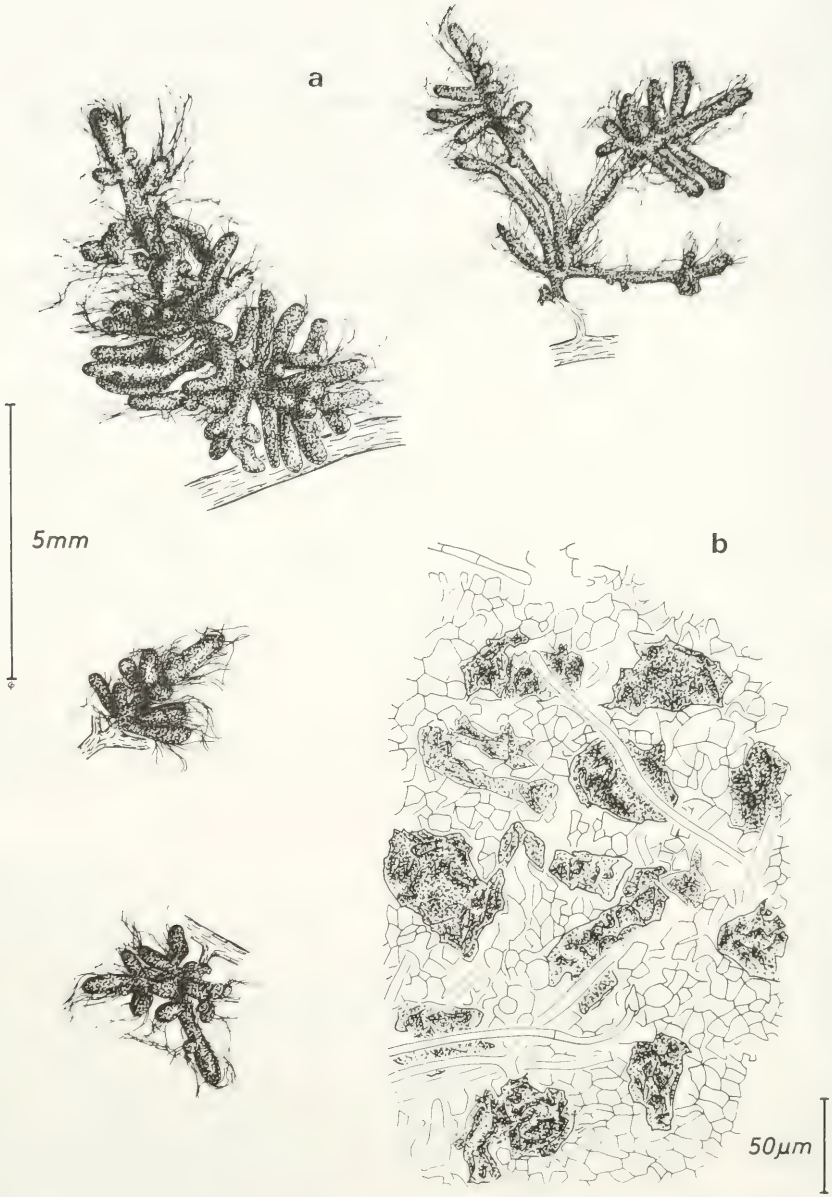

Abb. 1: „*Quercirhiza squamosa*". – a: Habitus von Mykorrhizen in verschiedenen Wachstumsstadien. – b: Mantelaufsicht bei mittlerer Vergrößerung: Zellrestschuppen, abziehende Hyphen und angulläre Mantelzellen gut erkennbar. – Alle Abb. von *GP 501 b*.

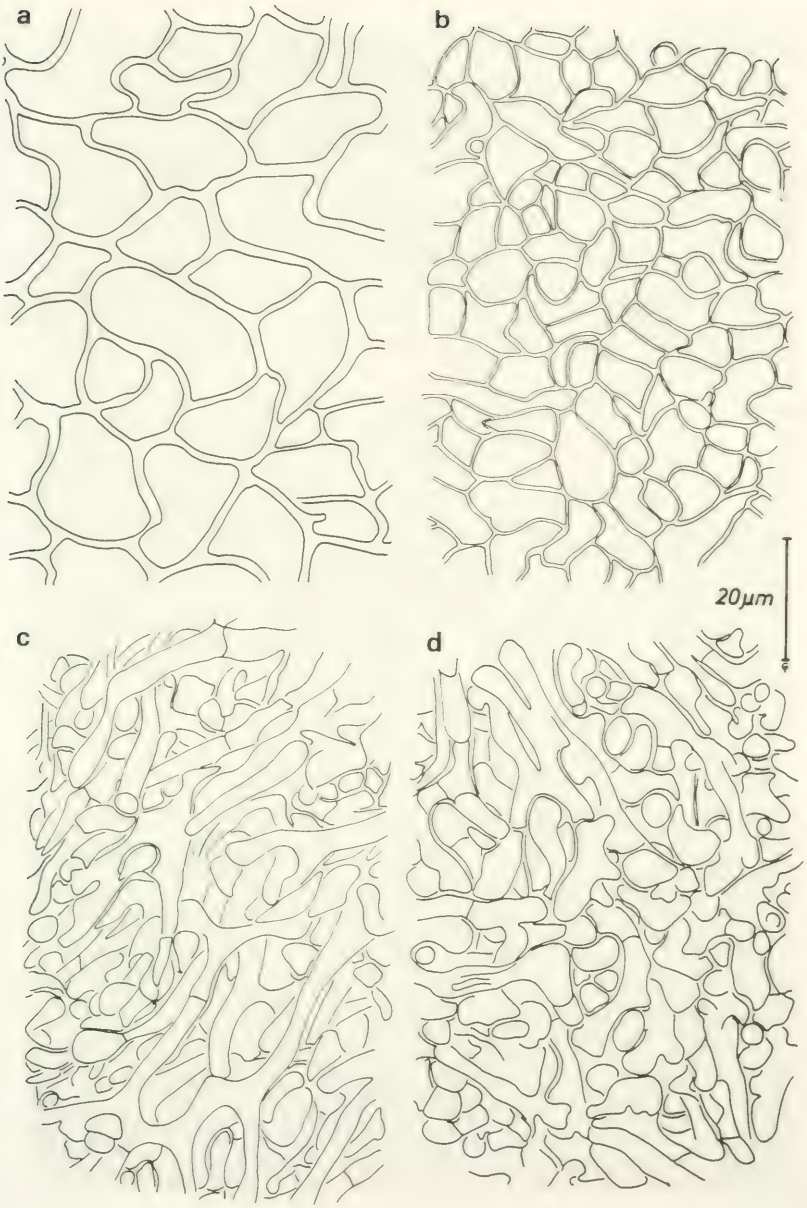

Abb. 2: „*Quercirhiza squamosa*"; Mantel in Aufsicht. – a: Mantelaußenseite: dickwandige, angulär bis abgerundete Zellen. – b: darunterliegende Schicht: Zellen kleiner, etwas dünnwandiger. – c: tieferliegende Mantelschicht, nahe Innenseite: unregelmäßig plectenchymatisch. – d: Mantelinnenseite: unregelmäßig plectenchymatisch, teilweise mit eingestreuten pseudoparenchymatischen Strukturen. – Alle Abb. von *GP 501 b*.

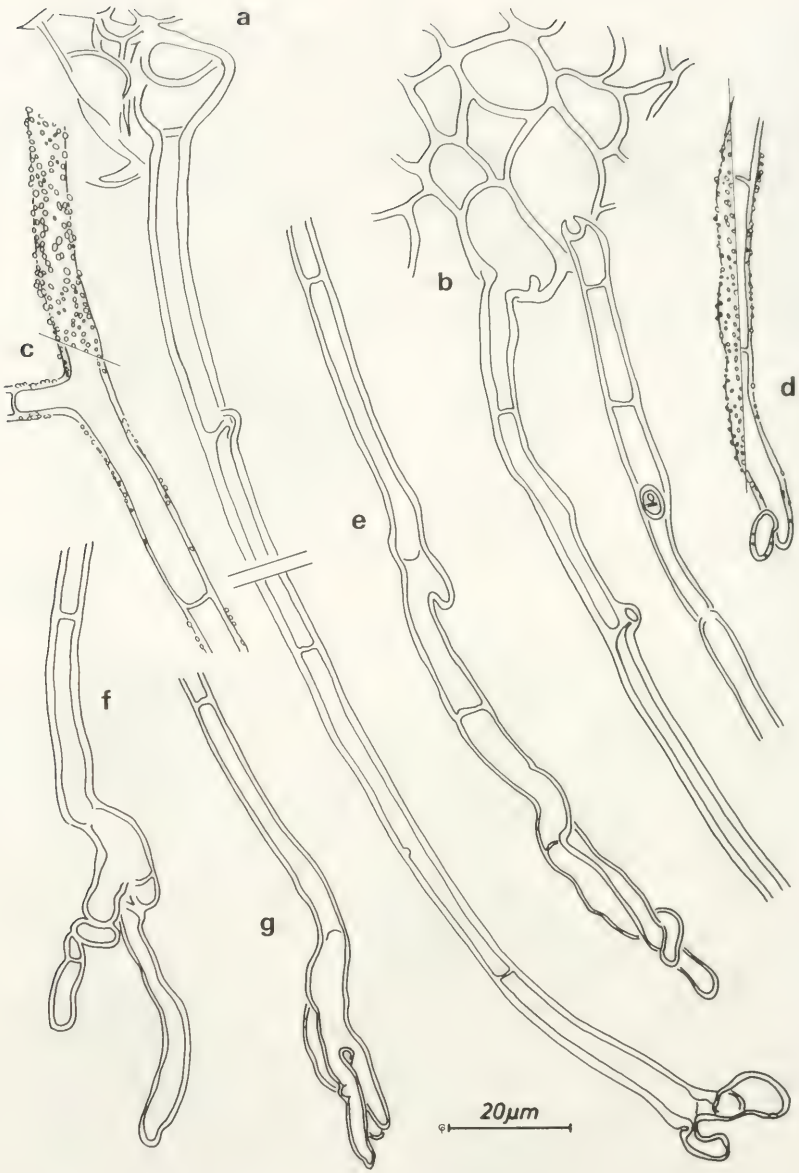

Abb. 3: „*Quercirhiza squamosa*"; abziehende Hyphen. – a: aus einem Zellhaufen der Manteloberfläche hervorgehende Hyphenbasis und im Substrat endende, deformiert-verzweigte Spitze. – b: aus benachbarten Zellen der Mantelaußenseite hervorgehende Hyphenbasen. – c: rechtwinklig verzweigte Hyphen, warzig inkrustiert. – d: warzig inkrustiertes Hyphenende mit kurzer Verzweigung. (c und d: in größerer Entfernung vom Mantel, teilweise in Aufsicht gezeichnet). – e–g: bizarr geformte, verzweigte Hyphenenden im Substrat. – Alle Abb. von *GP 501 b*.

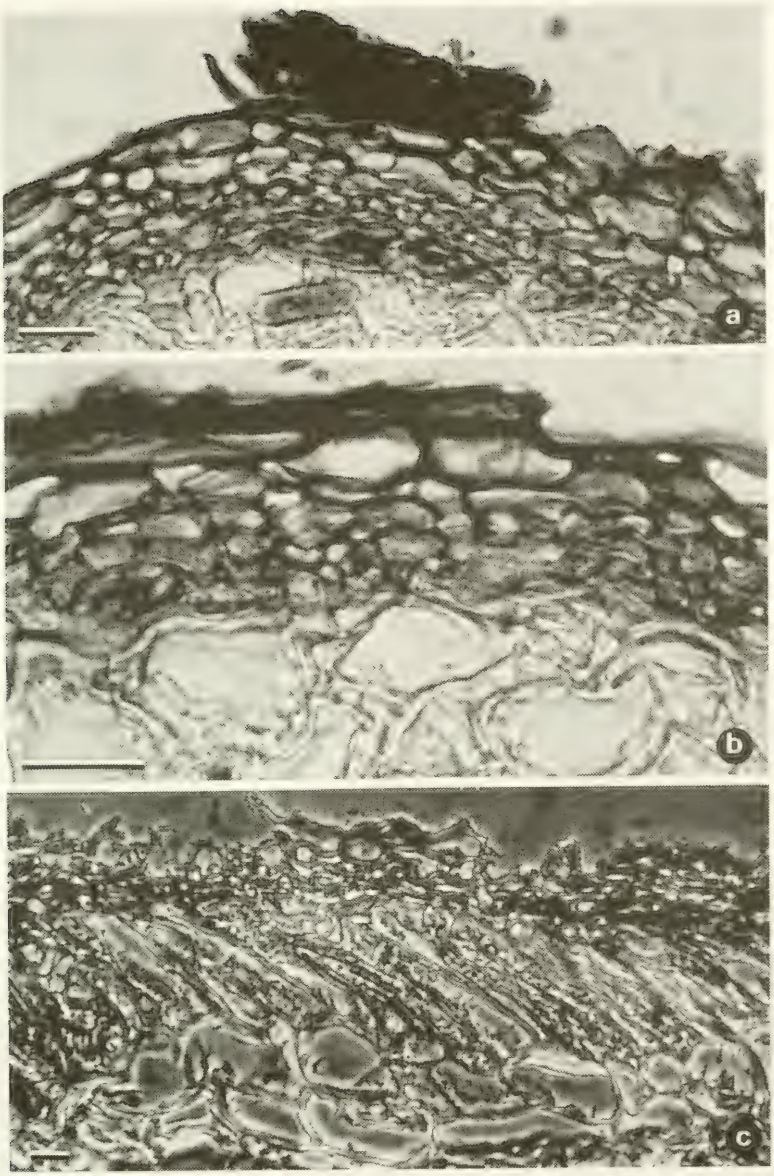

Abb. 4: „*Quercirhiza squamosa*". – a: Querschnitt: Mantel mit aufliegender Schuppe. – b: Querschnitt: Manteloberfläche mit verdickten Zellen, Hartigsches Netz scheinbar mehrschichtig (s. Längsschnitt unter 'c'). – c: Längsschnitt: Mantel mit aufliegenden Schuppen, nur eine Zellreihe mit Hartigschem Netz. – Alle Abb. von *GP 501b*. – Meßbalken entsprechen 10 µm.

Beiträge zur Kenntnis der Gattung Astragalus L. (Leguminosae) IV
Was ist Astragalus jabalambrensis Pau?

D. PODLECH

Zusammenfassung:
PODLECH, D.: Beiträge zur Kenntnis der Gattung Astragalus L. (Leguminosae) IV. Was ist Astragalus jabalambrensis Pau? – Sendtnera 3: 147–148. 1996. – ISSN 0944–0178.
Astragalus jabalambrensis Pau wird als eine *Oxytropis*-Art aus der Verwandtschaft von *O. pilosa* (L.) DC. erkannt und in diese Gattung übertragen. Eine ausführliche Beschreibung wird gegeben.

Abstract:
Astragalus jabalambrensis Pau is transferred to *Oxytropis*. It replaces *O. pilosa* (L.) DC. in Eastern Spain. An enlarged description is given.

Während der Bearbeitung der Gattung *Astragalus* L. für die Flora Iberica habe ich auch den Typus von *A. jabalambrensis* Pau untersuchen können. Diese Art ist von Pau nur unzureichend beschrieben worden, insbesondere fehlen Angaben über den Bau der Blüten. So ist ihm entgangen, daß es sich tatsächlich um eine Art der Gattung *Oxytropis* handelt. Dies hätte man auch am Fruchtbau feststellen können, da die Frucht ein Ventralseptum besitzt, wie es innerhalb der Gattung *Astragalus* bis heute nicht beobachtet werden konnte. So kommt es, daß diese Art unbekannt geblieben ist und nicht nur in allen Florenwerken und Aufzählungen, sondern auch in der Med-Checklist fehlt. Nach allen Merkmalen handelt es sich eindeutig um eine Art aus der Verwandtschaft von *Oxytropis pilosa* (L.) DC., sie ist jedoch von dieser durch eine Reihe von Merkmalen gut getrennt: Niedriger Wuchs, dichtere Behaarung, geringere Blättchenzahl, geringe Blütenzahl in der Infloreszenz, kleinere Blüten, Besitz von deutlichen Brakteolen. Sie ersetzt in Spanien *O. pilosa*, die ähnlich wie *Astragalus onobrychis* L. als östliche Art ihre Westgrenze in den Südwestalpen besitzt und zu Recht in Flora Europaea Vol. 2 für Spanien nicht genannt wird. Aus dem Gesagten ergibt sich, daß eine Übertragung in die Gattung *Oxytropis* notwendig ist.

Oxytropis jabalambrensis (Pau) Podlech, **comb. nov**.
Basion.: *Astragalus jabalambrensis* Pau, Not. Bot. Fl. Espan. 6: 46. 1895. **Holotypus**: [Spanien] Jabalambre, 8.7.1895, *Pau* (MA!: foto MSB!)

Pflanzen 4–10 cm hoch, am Grunde verzweigt, ± dicht behaart, mit dünnen, bis 3 mm langen ausschließlich weißen Haaren. Stengel zu mehreren, unverzweigt, kräftig,

sehr kurz oder bis 8 cm lang, fein gefurcht, dicht zottig, wirr abstehend behaart, später etwas verkahlend. Nebenblätter schmal-dreieckig, spitz, 8–10 mm lang, behaart, auf ca. 1 mm mit dem Blattstiel verbunden, unter sich frei. Blätter 2–5 cm lang; Blattstiel 1–1,5 cm lang, wie die Rhachis dünn, ± gebogen, locker bis ziemlich dicht abstehend behaart. Blättchen in 6–8 Paaren, schmalelliptisch, vorne gerundet bis spitzlich, 7–15 × 1–3 mm, beidseitig anliegend bis halbabstehend behaart. Infloreszenzstiel 2–11 cm lang, kräftig, fein gefurcht, locker abstehend behaart. Traube dicht, 4–7 blütig. Brakteen weißhäutig, 5–6 mm lang, schmal, spitz, behaart. Blütenstiele 1–2 mm lang, abstehend behaart. Brakteolen vorhanden, schmal, ca. 2 mm lang, am Grunde des Kelches ansitzend. Kelch bauchig-röhrig, 5–6 mm lang, zur Fruchtreife bis 8 mm lang, seidig halbabstehend behaart; Zähne pfriemlich, 3–4 mm lang, etwas länger als die Röhre. Krone kahl, gelblich. Fahne 8–10 mm lang; Platte breitelliptisch, vorne breit eingeschnitten, am Grunde rasch in den kurzen, breiten Nagel verschmälert. Flügel 7–9 mm lang; Platten nach vorne zu verbreitert und schief ausgerandet, 4–5 × ca. 2 mm; Öhrchen ca. 1 mm lang, Nagel 2,5–4 mm lang. Schiffchen 7–8 mm lang; Platten elliptisch, 3–4 × ca. 2 mm, vorne gerundet, mit aufgesetztem feinem, ca. 1 mm langem Spitzchen; Öhrchen kurz, Nagel 2,5–4 mm lang. Fruchtkonten sitzend, behaart; Griffel kurz, kahl. Früchte ca. 2 mm lang gestielt, aufrecht, gerade, 15–20 mm lang, ca. 4 mm breit und 3 mm hoch, beidendig zugespitzt, auf der Bauchseite tief gefurcht, am Rücken gerundet, dicht zottig abstehend behaart, mit einem sehr schmalen Ventralseptum. Samen unbekannt.

Verbreitung: Bisher nur vom Typus aus Spanien, Prov. Teruel bekannt.

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Typification of Russian and some other species of Astragalus I

D. PODLECH & A. SYTIN

Abstract:
D. PODLECH & A. SYTIN, Typification of Russian species of Astragalus. – Sendtnera 3: 149–176. 1996. – ISSN 0944–0178.

268 taxa of the genus *Astragalus* from Russia, which where not typified until now are here typified.

Zusammenfassung:
268 bisher nicht typifizierte Sippen der Gattung *Astragalus* aus Rußland werden hiermit typifiziert.

Most of the *Astragalus* species described in former times are not typified up to now despite the fact that a lot of floras of the former Soviet Union and parts of it have appeared in the last years. In most cases the authors of *Astragalus* taxa have not given any indication of type. Therefore all cited material must be considered as syntypes out of which a lectotype has to be choosen. In the herbarium of the Academy of Sciences in St. Petersbourg (LE) thousends of such syntypes are housed and separated from the main herbarium. During april of 1994 we have selected lectotypes where ever ist was possible for most of the Russian species of *Astragalus* so rich in species. In the case, that only one collection is cited with the description there are often many duplicates, so that also in this case a lectotypification is necessary. Also in cases that in the original description a holotype is indicated there are sometimes two ore more sheets of the type collection without indication which sheet should be the holotype. Also in these cases we have choosen a lectotype. All types have been marked by type labels on the sheets.

A. achundovii Grossh. 1952, Fl. Kavkaza, ed. 2, 5: 447. – **Lectotype** (here designated): Azerbaidzhania, distr. Noraschen, ad radices montis Tandery prope flum. Arpa-Czai, ca. 900 m, 11.5.1947, *Grossheim, Iljinskaja & Kirpicznikov* (LE!: the sheet marked as Lectotypus; Iso: LE!). A holotype as indicated in the description is not designated in LE, therefore a lectotypification is necessary.

A. acormosus Basil. 1923, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 4: 42. – Syntypes: Prov. Samarkand, Kschtut, 4000ft, 1892, *Komarov*; Seravschan, in monte Sauran-Kschtut, 14.6.1913, *Michelson 2413* (LE!). – **Lectotype** (here designated): Prov. Samarkand, Kschtut, 4000 ft, 1892, *Komarov* (LE!; Iso: LE!).

A.aflatunensis B.Fedtsch. 1905, Trudy Imp. S.-Petersburgsk. Bot. Sada 24: 201. – **Lectotype** (here designated): Aflatun, Tschatkal, 7000 ft, 30.6.1899, *Litwinow* (LE: the sheet marked as Lectotypus; Iso: LE!).

A. agameticus Lipsky 1900, Trudy Imp. S.-Petersburgsk. Bot. Sada 18: 38. – **Lectotype** (here designated): Turkmenia am Weg nach Agamet, 15.4.1887, *Walter* (LE: the sheet marked as Lectotypus; Iso: LE!).

A. aiwadzhi B.Fedtsch. 1940, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 8: 166. – **Lectotype** (here designated): Tadzhikistania, in ditione Schaartus, vallis Bischkent, inter pagos Aivadzh et Czaschmy, 18.6.1933, *Czernov* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. aktauensis Gontsch. 1941, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 9: 96. – **Lectotype** (here designated): jug. Aktau 3 km S traj. Chodzha-bech-ob, 2000 m, 3.7.1937, *Gontscharov & Michajlovski 155* (LE!: the sheet marked as Lectotypus; Iso: LE!). A holotype as indicated in the description is not designated in LE, therefore a lectotypification is necessary.

A. albertoregelia Winkler & B.Fedtsch. 1905, Izv. Imp. S.-Petersburgsk. Bot. Sada 5: 42. – Syntypes: Buchara, Baldzhuan, 3000 ft, V.–VI.1883; dt. 1884, *A.Regel* (LE!). – **Lectotype** (here designated): Buchara, Baldzhuan, 3000 ft, V.–VI.1883, (LE!; Iso: BRNU!, G!, LE!).

A. alitschuri B.Fedtsch. 1903, Trudy Imp. S.-Petersburgsk. Bot. Sada 21: 317 [O. Fedtschenko, Flora Pamira: 85]. – Syntypes: Jaschil-Kul, 24.8.1878, *Kuschakewitz*; Jaschil Kul, 1892, *Nasarov*; r. Alitschur, vom Tachatyr-tasch zum See Saryk, 17.7.1901, *O. & B.Fedtschenko*; – **Lectotype** (here designated): r. Alitschur, vom Tachatyr-tasch zum See Saryk, 17.7.1901, *O. & B.Fedtschenko* (LE!; Iso: C!).

A. amabilis Popov 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 11. – illeg. [non Popov 1938]. – **Lectotype** (here designated): Kasakhstania. prope Czilik (Alatau Transiliensis), in fauce Sogoty, 2.5.1937, *Popov* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. ammophilus Kar. & Kir. 1842, Bull. Soc. Imp. Naturalistes Moscou 15: 335. – illeg. [non Besser]. – **Lectotype** (here designated): inter fontem Sassyk-pastau et montes Arganaty, *Karelin & Kirilov 261* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!) = distr. no. *1386* (BR!, G!, H!, LE!, M!, MW, W!, WU!).

A. angreni Lipsky 1910, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 166. – Syntypes: Prov. Syr-Darja, Sta. Beklar-bek nahe Tschimkent, 20.5.1878, *A.Kuschakewitz* (LE!); Karakitaj im Angren-Tal, V.1880, *Mussa*, in hb. A.REGEL (LE!); Pereval Kendyr-aus zwischen Angren und Kokand, 8.5.1880, *Mussa* in hb. A.REGEL (LE!); Parkus, im Tschirtschika Tal, 19.6.1881, *A.Regel* (LE!); zwischen Khodzhakent und dem Berg Tschimkent, 4000 ft, 20.6.1881, *A.Regel* (LE!); bei Pskema, 22.6.1897, *B.Fedtschenko* (LE!); Niaz-bek, nahe Taschkent, 30.5.1903, *Lipsky*. – **Lectotype** (here designated): Niaz-bek, nahe Taschkent, 30.5.1903, *Lipsky* (LE!; Iso: LE!).

A. antoninae Grig. 1937, in Fl. Tadzhik. 5: 673. – **Lectotype** (here designated): Vachan, in valle fl. Jamast, 3880–4150 m, 20.7.1935, *Ovczinnikov & Aphanassjev 1330* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designa-

ted as holotype a lectotypification is necessary.

A. apiculatus Gontsch. 1937, in Fl. Tadzhik. 5: 668. – **Lectotype** (here designated): Montes Chasret-sultan, VI.1884, *Regel* (LE!: the sheet marked as Lectotypus, foto MSB!; Iso: LE). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. atlasovi Kom. 1914, Repert. Spec. Nov. Regni Veg. 13: 229. – **Lectotype** (here designated): in peninsula Kamtschatka valli centrali in alpibus Kaschchan prope pag. Pustshina, 7.7.1909, *Komarov 2821* (LE!: the sheet marked as Lectotypus; Iso: LE!, MW).

A. aulieatensis Popov 1926, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 14: 141. – Syntypes: prope Romanovki, Ur-Marala, 28.8.1921, *Abolin & Popov 8676*; p. Karagoina, 1.8.1922, *Korovin 2050–2053 et 2017*; Tschon-Kurgan, 3.9.1921, *Abolin & Popov 8732*. – **Lectotype** (here designated): p. Karagoina, 1.8.1922, *Korovin* (TASH-TAK; Iso: LE!).

A. badachschanicus Boriss. 1937, in Fl. Tadzhik. 5: 654 – **Lectotype** (here designated): Schugnan, in vic. traject. Jamg, 24.7.1904, *B.Fedtschenko* (LE!; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. baldshuanicus Popov 1923, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 4: 155. – Syntypes: inter opp. Kulab et Baldshuan, 24.7.1914, *Popov*; et ad opp. Karatag, *Popov*. – **Lectotype** (here designated): inter opp. Kulab et Baldshuan, 24.7.1914, *Popov* (LE!; Iso: LE!).

A. basineri Trautv. 1886, Trudy Imp. S-Petersburgsk. Bot. Sada 9: 444. – **Lectotype** (here designated): Turkmenistan, Kisil-Arvat, Achal-Tekke, 1883, *Becker 36* (LE!: the sheet marked as Lectotypus; Iso: G!, LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. beckerianus Trautv. 1876, Trudy Imp. S.-Petersburgsk. Bot. Sada 4: 363. – Syntypes: in Daghestania australis prope Kurusch, 1874, *Becker*; *Faust* (in Herb. TRAUTVETTER). – **Lectotype** (here designated): in Daghestania australis prope Kurusch, 1874, *Becker* (LE!; Iso: BM!, BR!, G-BOIS!, H!, JE!, K!, LE!, M!, P!, PR!, PRC!, W!, WU!).

A. bifidus Ledeb. 1843, Fl. Ross. 1: 605. – Syntypes: Sibiria baicalensi ad fl. Irkut pr. Tor, 1828, *Turczanninov*; dto., 1830, *Turczanninov*. – **Lectotype** (here designated): Sibiria baicalensi ad fl. Irkut pr. Tor, 1828, *Turczanninov* (LE!; Iso: H!).

A. borissianus Gontsch. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 35. – **Lectotype** (here designated): Montae Alaj, ad fontes fl. Schachimardan, opp. Scobelev, 22.5.1916, *Drobov 1020* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. borissovae Grossh. 1948, Dokl. Akad. Nauk Azerbajdzhansk. SSR 4: 26. – **Lectotype** (here designated): Prov. et distr. Tiflis, secus rivum Dabachanka supra Hortum Botanicum Tifliensis, 17.5.1914, *Woronow* in Herb. Fl. Cauc. *371* (LE!; Iso: LE!). As there is no holotype designated a lectotypification is necessary.

A. borodinii Krassn. 1887, Enum. pl. Tian-schan Or.: 46. – **Lectotype** (here designated): reg. Tian Schan, prope fl. Tscharyn, 1886, *Krassnow* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. bossuensis Popov 1928, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 3: 20. – **Lectotype** (here designated): Tian-Schan occid., in loco Kaplanbek prope Taschkent, 19.4.1927 (flor.) et 1.5.1928 (fruct.), *Popov & Vvedensky* in Herb. Fl. As. Med. *353* (LE!: the sheet marked as Lectotypus; Iso: B!, BP!, BR!, BRNU!, G!, K!, LE!, MW, P!, PR!, W!).

A. brachycarpus M.Bieb. 1808, Fl. Taur.-cauc. 2: 201. – Syntypes: in promontorio caucasico, circa thermas constantinomontanas (H!); et ad latere montis Beschtau. – **Lectotype** (here designated): ad latere montis Beschtau, *Steven* (H!; Iso: W!, [LE!: ex Caucaso, hb. BIEBERSTEIN]).

A. brachypetalus Trautv. 1886, Trudy Imp. S.-Petersburgsk. Bot. Sada 9: 446. – **Lectotype** (here designated): [Kasikibaran distr. Karabach: locality errouneous, the species does not occur in the caucasus], *Smirnow* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. brachypus Schrenk 1841, in Fischer & C.A.Meyer, Enum. Pl. Nov. 1: 79. – **Lectotype** (here designated): ad lacum Balchasch, 6.6.1840, *Schrenk* (LE!; Iso: GOET!, LE!: many sheets, P!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A.brevifolius Ledeb. 1831, Fl. Altaica 3: 334. – **Lectotype** (here designated): juxta fl. Tschuja, *Bunge* (LE!: the sheet marked as Lectotypus; Iso: BR!, LE!, P!, TUB!).

A. bucharicus Regel 1886, Trudy Imp. S.-Petersburgsk. Bot. Sada 9: 605. – **Lectotype** (here designated): regio bucharica, apud declivia orientalia montium Gasi-Mailik, 4000–5000 ft, 13.–25.5.1883, *A.Regel* (LE!: the sheet marked as Lectotypus; Iso: BR!, G!, GOET!, K, LE!, M!, P!, W!, WU!).

A. bungei C.Winkl. & B.Fedtsch. 1905, Trudy Imp. S.-Petersburgsk. Bot. Sada 24: 198. – Syntypes: Usgent, 28.5.1880, *A.Regel*; Jassy bei Urgent, 4000 ft, 28.5.1880, *A.Regel* (LE!). – **Lectotype** (here designated): Usgent, 28.5.1880, *A.Regel* (LE!).

A. buschiorum Galushko 1970, Novosti Sist. Vyssh. Rast. 6: 215. – **Lectotype** (here designated): Caucasus borealis, Balcaria, Chysny-Su in regione jug. Skalistyi, 3.8.1965, *Galushko* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. calycinus M.Bieb. 1808, Fl. Taur.-Cauc. 2: 199. – **Lectotype** (here designated): ad rivum Kumam, circa Maschar, *Bieberstein* (LE!: the sheet marked as Lectotypus; Iso: H!, LE!).

A. candidissimus Ledeb. 1831, Fl. Altaica 3: 309. – **Lectotype** (here designated): ad fl. Irtysch inter fl. Kurtschum et Narym, 6.Juni, *Meyer* (LE!: the sheet marked as Lectotypus; Iso: LE!, MSB!, P!; PRC! – more presumable isotypes without exact locality: BM!, GOET!, REG!, TUB!, W).

A. chaetodon Bunge 1852, Beitr. Fl. Russl.: 96.
– var. *samarcandicus* Basil. 1923, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 4: 47. – Syntypes: Samarkandsk. obl., Dasht, 28.3.1914, *Michelson 3286*; Khodzhentsk. Distr., bei Tschaschma-Arzanak, 28.3.1914, *Michelson* (LE!). – **Lectotype** (here designated) Samarkandsk. obl., Dasht, 28.3.1914, *Michelson 3286* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. chalilovii Grossh. 1952, Fl. Kavkaza, ed. 2, 5: 445 – **Lectotype** (here designated): Azerbaidzhania, in distr. Nachiczevan prope fontem Alma-bulagh, in monte Karaghut, 1980–2000 m, 10.6.1947, *Grossheim & Chalilov* (LE!; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. chionanthus Popov 1928, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 3: 21. – **Lectotype** (here designated): Tian-schan occid., sub cacumine montis Tschimgan Majoris, 11.8.1926, *Rajkova* in Herb. As. Med. *354a* (LE!: the sheet marked as Lectotypus; Iso: B!, BP!, BR!, BRNU!, G!, LE!, MA!, MW, P!, PR!).

A. chiwensis Bunge 1880, Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ. 26, 2: 247. – Syntypes: prope Chiwa inter Karak-aty et Adam-Ulgan, 30.4.1873, *Krause & Korolkov*; and near Tschinaktschika, 19.6.1963 *Krause & Korolkov* (LE!). – **Lectotype** (here designated): prope Chiwa inter Karak-aty et Adam-Ulgan, 30.4.1873, *Krause & Korolkov* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. chodshenticus B.Fedtsch. 1936, Trudy Tadzhiksk. Bazy 2: 152. – Syntypes: Chodshent, in monte Tschaur, decl. or. jugi Kara-tepe, 23.3. (5.4.) 1914, *Michelson 3326*; prope Chodshent ad fl. Syr-darja, 10.5. (23.5.) 1914, *Knorring 155*; in jugo australi montis Ak-bel, ad ripam dextram fluvii Syr-darja, 35 km a Chodshent, 17.5.1916, *W.Drobov 983* (LE!). – **Lectotype** (here designated): prope Chodshent ad fl. Syr-darja, 10.5. (23.5.) 1914, *Knorring 155* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. chorgosicus Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 257. – **Lectotype** (here designated): Prov. Semirtsch., Dzharkant, in monte Alatau prope Basch-kuntschi ad fl. Khorghos, 3.5.1907, *Divnogorskaja* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. chrysopterus Bunge 1877, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 32. – **Lectotype** (here designated): China prov. Kansu, 1.-15.6.1873, *Przewalski 164* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. cinereus Turcz. 1842, Bull. Soc. Imp. Naturalistes Moscou 15: 766 et in Fl. Baical.-Dahur. 1: 322. 1842–1845. – illeg. [non DC., Willd.] – **Lectotype** (here designated): insula Olchon, *Turczanninov* (LE!: the sheet marked as Lectotypus; Iso: BR!, G!, K!, LE!, M!, MSB!, MW, P!, WU!).

A. circassicus Grossh. 1939, Izv. Azerbajdzhansk.. Fil. nos. 1–2: 115. – **Lectotype** (here designated): in jugo Markhot pr. Novorossisk, 19.6.1926, *Dzevanovsky 76* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. cisdarvasicus Gontsch. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 36, 102. – **Lectotype** (here designated): Tadzhikistania austr., in valle fl. Vachsch, 25.5.1932, *Gontscharov, Grigorjev & Nikitin 46* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. coarctatus Trautv. 1876, Trudy Imp. S.-Petersburgsk. Bot. Sada 4: 365. – **Lectotype** (here designated): in monte Ararat, ad lacum Küp-göl, 8.8.1871, *Radde 661* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. cognatus Schrenk 1841, in Fischer & Meyer, Enum. Pl. Nov. 1: 81. – **Lectotype** (here designated): ad lacum Balchasch, 5.6.1840, *Schrenk* (LE!: the sheet marked as Lectotypus; Iso: B!, BM!, G!, GOET!, K!, L!, LE!, P!, W!).

A. confiniorum Boriss. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 53. – **Lectotype** (here designated): Jugus Kopet-Dagh. m. Massinew, 1.6.1889, *Antonov* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. conjecturalis Schischk. 1929, Izv. Tomsk. Gosud. Univ. 81: 478. – Syntypes: Distr. Musch, prope opp. Melazgerd, 1500 m, 2.6.1916 (flor.); et 25.6.1916, *Schischkin* (LE!). – **Lectotype** (here designated): Distr. Musch, prope opp. Melazgerd, 1500 m, 2.6.1916 (flor.) (LE!).

A. conspicuus Boriss. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 49. – **Lectotype** (here designated): Transcaucasia, inter Ordubad et Akulis, 19.5.1914, *Woronov 14209* (LE!; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. cornu-bovis Lipsky 1900, Trudy Imp. S.-Petersburgsk. Bot. Sada 18: 23. – **Lectotype** (here designated): Transcaspia, Pereval, 26.4.1889, *Antonow* (LE!: the sheet marked as lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. corydalinus Bunge 1874, Trudy Imp. S.-Petersburgsk. Bot. Sada 3: 101. – **Lectotype** (here designated): in montibus Irtasch Turkestaniae [bass. Angren], *Krause* (LE!; Iso: prope Taschkent, *Krause*: P!).

A. curvipes Trautv. 1886, Trudy Imp. S.-Petersburgsk. Bot. Sada 9: 446. – **Lectotype** (here designated): Kisil-Arwat, 1883, *Becker* (LE!: the sheet marked as Lectotypus; Iso: G!, LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. darwasicus Basil. 1923, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 4: 44. – Syntypes: Buchara, Darwas, Kala-i-khum, 5000–6500 ft, 1.6.1897, *Korshinsky 1033* (LE!); dto., *1039*. – **Lectotype** (here desinated): Buchara, Darwas, Kala-i-khum, 5000–6500 ft, 1.6.1897, *Korshinsky 1039* (LE!).

A. dendroides Kar. & Kir. 1842, Bull. Soc. Imp. Naturalistes Moscou 15: 339. – **Lectotype** (here designated): Alatau ad fl. Sarchan, *Karelin & Kirilov 269* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!); other isotypes with the number *1396* (BR!, G!, LE!, MSB!, P!, W!).

A. densiflorus Kar. & Kir. 1842. Bull. Soc. Imp. Naturalistes Moscou 15: 329. – Syntypes: Alatau ad fontes fluv. Lepsa et Sarchan, medio julii 1891, *Karelin & Kirilov 245*; et inter Baskan et Sarchan, finem julii 1891, *Karelin & Kirilov*. – **Lectotype** (here designated): Alatau ad fontes fluv. Lepsa et Sarchan, medio julii 1891, *Karelin & Kirilov 245* (LE!: the sheet marked as Lectotypus; Iso: LE!: many sheets, P!) – Syntypes were distributed with nr. *1378* (BR!, G!, H!, K!, LE!, MSB!, M!, P!, WU!).

A. depauperatus Ledeb. 1831, Fl. Altaica 3: 314. – **Lectotype** (here designated): prope Loktewsk, *Bunge* (LE!; Iso: P!: no. *375* – probably isotypes [Altai]: MSB!, W!)

A. dianthus Bunge 1880, Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ. 26(2): 283. – Syntypes: Bossu prope Taschkent, 6.4.1871, *O.Fedtschenko* (LE!, P!); Gory Min-Urjuka, *Krause*. – **Lectotype** (here designated): Gory Min-Urjuka, *Krause* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. dilankuri Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 175. – **Lectotype** (here designated): zwischen Dilankur und Saraim, am Paß Kizyl-kutel montium Karatau, 4000 ft, 9.4.1881 (in some schedis 1882), *A.Regel* (LE!: the sheet marked as Lectotypus; Iso: BM!, K!, LE!, M!).

A. discessiflorus Gontsch. 1937, in Fl. Tadzhik. 5: 676. – **Lectotype** (here designated): Tadzhikistania austr., jug. Sanglak supra pag. Peche, 12.6.1932, *Gontscharov, Grigoriev & Nikitin* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. distentus Boriss. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 52. – **Lectotype** (here designated): Pamiro-Alaj, jugum Vachsch in faucibus montis Sufan-mir-tau, 4.7.1932, *Gontscharov, Grigoriev & Nikitin 499* (LE!; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. dschanbulakensis B.Fedtsch. 1905, Trudy Imp. S.-Petersburgsk. Bot. Sada 24: 236. – Syntypes: Kujuk, V.1881, *Mussa*; Dschanbulak, V.1878, *Kuschakewicz* (LE!). – **Lectotype** (here designated): Kujuk, V.1881, *Mussa* (LE!: the sheet marked as Lectotype; Iso: LE!).

A. dschimensis Gontsch. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 30. – **Lectotype** (here designated): Asia media, Alatau soongoricus, ad fl. Taldy in Irenchaburga, prope limitem prov. chinensis Sin-tzian, 5000–8000 ft, 15.5.1879, *A.Regel* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. ekatherinae B.Fedtsch. 1921, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 2: 49. – Syntypes: Turkmenistan, Gaudan, 28.5.1916, *B.Fedtschenko* (LE!); Firjusa bei Ashabad, 10.5.1916, *Androssov*. – **Lectotype** (here designated): Firjusa bei Ashabad, 10.5.1916, *Androssov* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. ellipsoideus Ledeb. 1831, Fl. Altaica 3: 319. – T: non indicated; see under var. *elongatus* Ledeb. (= type variety).
– var. ***elongatus*** Ledeb. 1831, Fl. Altaica 3: 319. – illeg. [Typus variety] – **Lectotype** (here designated): in montibus Arkaul et Dolenkara, 14.5.1826, *C.A.Meyer* (LE!: the sheet marked as Lectotypus; Iso: GOET!, K!, LE!).
– var. ***abbreviatus*** Ledeb. 1831, Fl. Altaica 3: 320. – **Lectotype** (here designated): circa montes Tschingistau et Dschigilen, *C.A.Meyer* (LE!; Iso: GOET!, K!, P!, W!).

– var. ***intermedius*** Ledeb. 1831, Fl. Altaica 3: 319. – **Lectotype** (here designated): prope Ustkamenogorsk, *Ledebour* (LE!: the sheet marked as Lectotypus; Iso: K!, LE!, P!: Irtysch, W!).

A. eremothamnus Kar. & Kir. 1842, Bull. Soc. Imp. Naturalistes Moscou 15: 334. – **Lectotype** (here designated): Songoria prope fontem Tschingildy, *Karelin & Kirilov 259* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!); other isotypes with nr. *1398b* (G!, LE!).

A. eriocarpus M.Bieb. 1808, Fl. Taur.-Cauc. 2: 196. – illeg. [non DC.]. – **Lectotype** (here designated): in Iberia, circa Tiflin, *Steven* (LE!; Iso: H!, P!, W!).

A. erioceras Ledeb. 1843, Fl. Ross. 1: 626. – **Lectotype** (here designated): in littore orientali m. caspii [Novo-Alexandrowsk], V.1840, *Karelin* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!)
– var. ***ferganensis*** Popov 1924, Schedae ad Herb. Fl. Asiae Mediae 1–2 [Suppl. Bjull. Sredne-Aziatsk. Gosud. Univ. 7]: 13. – **Lectotype** (here designated): Prov. Fergana, distr. Kokand, ad petroleas "Santo", 18.4.1923, *Popov & Vvedensky* in Herb. Fl. As. Med. No. *8* (LE!: the sheet marked as Lectotypus; Iso: LE!, PR!, W!).

A. eriolobus Bunge 1835, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savants 2: 591; Verz. Pfl. Altai-Geb.: 92, 1836. – **Lectotype** (here designated): [Altai or.] prope Metallofodinam Loktewsk, 1832, *Bunge* [*Astragalus eriolobus* Bunge, Suppl. fl. Alt. in hb. FISCHER: LE!: in Sector Sibiria; Iso: LE!: in Sector Middle Asia].

A. eugenii Grossh. 1946, in Fl. URSS 12: 884. – **Lectotype** (here designated): in Daghestania prope Kurusch, in monte Basardjusi, 1874, *Becker* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. euoplus Trautv. 1876, Trudy Imp. S.-Petersburgsk. Bot. Sada 4: 364. – **Lectotype** (here designated): in districtu Karabach, in itinere versus Ochtschi, 10.5.1871, *Radde 43* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. exasperatus Basil. 1923, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 4: 45. – Syntypes: Serafschan: Kschtut, 4000 ft, V.1892, *Komarov*; Kuli Mohif, 7500 ft, V.1892, *Komarov* (LE!); Prov. Buchara, Schut, VI.1896, *Lipsky* (LE!). – **Lectotype** (here designated): Serafschan: Kschtut, 4000 ft, V.1892, *Komarov* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. exilis Korovin 1938, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 7: 171. – **Lectotype** (here designated): Tasch-tepe, 20.7.1913, *Vassiljevskaja 752* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. eximius Bunge 1880, Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ. 26, 2: 244. – Syntypes: Turkestan, Tianschan, Berge Naubid, *O. Fedtschenko* (LE!); et prope Oalyk in valle Serawschan, *O.Fedtschenko*. **Lectotype** (here designated): prope Oalyk in valle Serawschan, *O.Fedtschenko* (LE!).

A. fedtschenkoanus Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 150. – Syntypes: Stanzia Dzhambul, 12.4.1880, *A.Regel* (LE!); St. Kujuk, am Trakt Tschimkent - Aulieata, V.1881, *Mussa*; Alamedin, 5000–9000 ft, 23.- 25.5.1880,

Fetissov (LE!); Aksu, 16.6.1903, *Lipsky* (LE!). – **Lectotype** (here designated): St. Kujuk, am Trakt Tschimkent - Aulieata, V.1881, *Mussa* (LE!).

A. fetissowii B.Fedtsch. 1905, Trudy Imp. S.-Petersburgsk. Bot. Sada 24: 202. – Syntypes: Alexandrovskih Khrebet, Arassan, 5.6., *Fetissov*; Narynskago Khrebet, zwischen Bolschim Naryn & Istokami At-basch, 12000 ft, 25.7.1882, *Fetissov*; At-basch, 8500 ft, 24.8.1879, *Fetissov* (LE!). – **Lectotype** (here designated): Narynskago Khrebet, zwischen Bolschim Naryn & Istokami At-basch, 12000 ft, 25.7.1882, *Fetissov* (LE!).

A. filicaulis Ledeb. 1843, Fl. Ross. 1: 637. – illeg. [superfl.]. – Syntypes: in littore orientali m. caspii, *Karelin; Lessing* (LE!). – **Lectotype** (here designated): in littore orientali m. caspii, *Karelin* (LE!).

A. foliolosus Bunge 1868, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 74 et l.c. 15 (1): 125. 1869. – **Lectotype** (here designated): Anatolia, Safranbol, inter Aradsh, Kastamani et Hamamli, *Wiedemann* (LE!; Iso: G-BOIS!).

A. fumosus Boriss. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 40. – **Lectotype** (here designated): Distr. Artvin, ad fl. Czoroch prope Ordshoch, 9.6.1914, *Turkevicz 742* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. galagani Lipsky 1898, Trudy Imp. S.-Petersburgsk. Bot. Sada 14: 258. – **Lectotype** (here designated): ad lacum Kardabacza, 4500–5000 ft, 7.(19.)8.1895 (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. gebleri Bong. 1841, in Bongard & C.A.Meyer, Verz. Pfl. Saisang-Nor: 24, t. 4. – **Lectotype** (here designated): ad fl. Irtysch supra fluv. Kurtschum, *Politoff* (LE!: the sheet marked as Lectotypus; Iso: BR!, G!, LE!, M!, P!, W!).

A. glabriusculus Gontsch. 1941, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 9: 97. – illeg. [non A.Gray]. – **Lectotype** (here designated): Kopetdagh, Massinev, 1.6.1889, *Antonow* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. glomeratus Ledeb. 1831, Fl. Altaica 3: 327. – **Lectotype** (here designated): ad fl. Irtysch inter Woroninsk et Nabaty, *C.A.Meyer* (LE!: Altai, 1826; Iso: P!, TUB! – [Altai: GOET!, REG!]).

A. gregorii B.Fedtsch. & Basil. 1930, in Grum-Grjimail, Zap. Mongolij i Urjango Kraj 3 (2): 815. – Syntypes: Chines. Altai, lake Dain-gol, 7400 ft, 28.6.1903, *Grum-Grjimail*; Chines. Altai, between lakes Dain-gol and Ak-khorum, 7500 ft, 29.6.1903 *Grum-Grjimail* (LE!). – **Lectotype** (here designated): Chines. Altai, lake Dain-gol, 7400 ft, 28.6.1903, *Grum-Grjimail* (LE!).

A. haematocarpus Bunge 1868, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 118. - Syntypes: Caucasus or., Tufandagh, *C.A.Meyer*; Chanakoi-tau Daghestaniae, 8500 ft, *Owerin* (P!; G-BOIS!). – **Lectotype** (here designated): Caucasus or., Tufandagh, *C.A.Meyer* (P!; Iso: LE!).

A. haesitabundus Lipsky 1894, Trudy Imp. S.-Petersburgsk. Bot. Sada 13: 290. – Syntypes: Daghestania, circa Czir-jurt, ad fluvium Sulak et circa castellum Gunib, 13.5.1890, *Lipsky*; dto., 12.5.1891, *Lipsky* (LE!). –**Lectotype** (here designated): Daghestania, circa Czir-jurt, ad fluvium Sulak et circa castellum Gunib, 13.5.1890, *Lipsky* (LE!).

A. heptapotamicus Sumnev. 1933, Sist. Zametki Mater. Gerb. Krylova Tomsk. Gosud. Univ. Kujbyseva 1933 (5–6): 7. – Syntypes: Kazakhstan, Dshungarsky Alatau, Distr. Kopal, Sujun Tübe, 17.6.1909, *Lipsky 1645*; Kirghisia, Tjan-schan, ad lacus Son-kul, 2.7.1913, *Schischkin* (TK); in jugo Bel-Bulak, 29.6.1913, *Schischkin* (TK). – **Lectotype** (here designated): Kazakhstan, Dshungarsky Alatau, Distr. Kopal, Sujun Tübe, 17.6.1909, *Lipsky 1645* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. heterodontus Boriss. 1936, Trudy Tadzhiksk. Bazy 2: 161. – **Lectotype** (here designated): prope lacum Kara-kul, 2.7.1913, *Knorring* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. heterotrichus Gontsch. 1946, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 9: 149. – **Lectotype** (here designated): Montes Cisdarwasici, Karanak in vic. Tavildara, 5.7.1897, *Lipsky 2961* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. hissaricus Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 173. – Syntypes: Hissar, Khoschbulak, Gory Gazi-Mailik, zwischen Kafirnigan und Vakhsch, 4000–5000 ft, 3.–7.5.1883, *A.Regel*; Baldzhuan, 3000–4000 ft, IV.1884, *Musa* (LE!); Buchara, Schachrisjabs, Tamschusch, 9.6.1896, *Lipsky 220* (LE!); Kuna-Kischlak, 17.6.1896, *Lipsky* (LE!). – **Lectotype** (here designated): Hissar, Khoschbulak, Gory Gazi-Mailik, zwischen Kafirnigan und Vakhsch, 4000–5000 ft, 3.-7.5.1883, *A.Regel* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. holosericeus Popov 1937, in Fl. Tadzhik. 5: 662. – illeg. [non Jones]. – **Lectotype** (here designated): prope pagum Novovad, 8.7.1932, *Gontscharov & al. 580* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. horizontalis Kar. & Kir. 1841, Bull. Soc. Imp. Naturalistes Moscou 14: 406. – **Lectotype** (here designated): in deserto Soongoro-Kirghisico ad rivulos Tonsyk et Narym, *Karelin & Kirilov 197* (LE!: the sheet marked as Lectotypus; Iso: BM!, BR!, G!, LE!, MW, W!).

A. humilis M.Bieb. 1808, Fl. Taur.-Cauc. 2: 203. – **Lectotype** (here designated): in Caucaso iberico, e herb. BIEBERSTEIN (LE!; Iso: B-WILLD 14032!: ex Caucaso alteriore, MARSHALL, MW: Hb. TRINIUS 2222).

A. hyalolepis Bunge 1868, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 105 et l.c. 15 (1): 185. 1869. – Syntypes: In Iberia, Alvar, *Wilhelms*; prope Trialethi, *Wiedemann* (LE!); ad lacum Goktscha ad pedem montis Tschitschaglu, 2000 m, *Owerin*; dto. *Seidlitz*. – **Lectotype** (here designated): In Iberia, Alvar, *Wilhelms* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. hypogaeus Ledeb. 1829, Icon. pl. nov. 1: t. 95. – Syntypes: juxta fl. Tscharysch et Buchtorma, *Ledebour*; in deserto soongoro-kirghisico, *Meyer*. – **Lectotype** (here

designated): juxta fl. Tscharysch et Buchtorma, *Ledebour* (LE!: Altai anno 1826; Iso: probably REG!).

A. hystrix Fisch. 1853, Bull. Soc. Imp. Naturalistes Moscou 26(2): 403. – **Lectotype** (here designated): ad Seidkhozi provinciae Atropatanicae (Aderbeidshan), 16.5.1828, *Szovits 234* (LE!: the sheet marked as Lectotypus; Iso: G-BOIS!, JE!, LE!, MSB!).

A. iliensis Bunge 1866, Bull. Soc. Imp. Naturalistes Moscou 39 (2): 20. – **Lectotype** (here designated): Am Ili, 13.5., *Semenov* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!).

A. imetensis Boriss. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 43. – **Lectotype** (here designated): Kirghisia, fl. Naryn, in valle fl. Naryn prope ostium Imet, 19.7.1913, *Saposhnikov* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. inaequalifolius Basil. 1922, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 3: 117. – **Lectotype** (here designated): Syr-Dar. obl., Taschkent, syst. fl. Tschirtschik, dolina r. Pskem, 22.6.1914, *Minkwitz 849* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. inderiensis Claus 1851, Beitr. Pflanzenkunde Russ. Reiches Lief. 8: 64. – **Lectotype** (here designated): am inderskischen Salzsee, anno 1834, *Claus* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. inopinatus Boriss. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 51. – **Lectotype** (here designated): Jacutia mer., in valle fl. Amge, Tas-chaja, 28.7.1902, *Olenin 101* (LE!; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. intermedius Kar. & Kir. 1842, Bull. Soc. Imp. Naturalistes Moscou 15: 340. – illeg. [non Host]. – **Lectotype** (here designated): Alatau inter fl. Baskan et Sarchan, *Karelin & Kirilov 270* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!); other isotypes with nr. *1415* (BR!, G!, K!, LE!, M!, MW, P!, W!).

A. interpositus Boriss. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 49. – **Lectotype** (here designated): Caucasus, ad glaciem Bezengi, 1856 m, 6.7.1913, *Busch* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. involucratus Lipsky 1901, Trudy Imp. S.-Petersburgsk. Bot. Sada 18: 46. – **Lectotype** (here designated): Baissun (Buchara), 6.6.1897, *Lipsky 219* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. irinae B.Fedtsch. 1940, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 8: 167. – Syntypes: in montibus Hissaricis Tadzhikistaniae, in valle fl. Warsob, 7.7.1896, *Lipsky* (LE!); et in valle fl. Diachan-dara ad Chosch-hassan, 24.6.1896, *Lipsky*. – **Lectotype** (here designated): in valle fl. Diachan-dara ad Chosch-hassan, 24.6.1896, *Lipsky* (LE!).

A. ishigensis Kom. 1929, Fl. Kamtsch. 2: 279. – **Lectotype** (here designated): [Kamtschatka] circa Gishiga (Ishiga), *Kruhse* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. iskanderi Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 187. – **Lectotype** (here designated): Samarkandsk. obl., Ozero Iskander-kul, 7000 ft, V.1893, *Komarov* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. isphairamicus B.Fedtsch. 1940, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 8: 168. – **Lectotype** (here designated): jug. Alaicum, in valle fl. Isphairamsai, supra Langar, 22.6.1931, *Lipschitz 165* (LE!: the sheet marked as Lectotypus; Iso: LE!, MW)

A. jagnobicus Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 138. – Syntypes: Prov. Samarkand., Pasrut, 6300–10700 ft, 24.6.1870, *O.Fedtschenko* (LE!); zw. Novobad et Varsouta, VII.1881, *Capus* (LE!); Hissar, Rufigar, 17.7.1896, *Lipsky*. – **Lectotype** (here designated): Hissar, Rufigar, 17.7.1896, *Lipsky* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. jakkabagi Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 160. – **Lectotype** (here designated): Jakkabag, 2880 ft, 3.6.1897, *Lipsky* (LE! the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. jarmolenkoi Gontsch. 1938, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 7: 158. – **Lectotype** (here designated): Kopet Dagh, in cacumine Czapan-dag, 2300 m, 14.7.1928, *B.Fedtschenko & al. 666* (LE! the sheet marked as Lectotypus; Iso: LE!). A holotype as indicated in the description is not designated in LE, therefore a lectotypification is necessary.

A. jassiensis B.Fedtsch. 1905, Trudy Imp. S.-Petersburgsk. Bot. Sada 24: 236. – **Lectotype** (here designated): Jassy, prope Urgent, 4000 ft, 28.5.1880, *A.Regel* (LE!; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. jolderensis B.Fedtsch. 1921, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 2: 52. – Syntypes: Kara-Kala, Gora Sjunt, Straße durch Joldere, 15.5.1916, *B.Fedtschenko* (LE!); Gora Sjunt, gegen den Paß (Pereval), 8.5.1912, *Lipsky 3308*. – **Lectotype** (here designated): Gora Sjunt, gegen den Paß (Pereval), 8.5.1912, *Lipsky 3308* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. kabadianus Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 161. – Syntypes: Kabadian, zwischen Kabadian und Kurgan-bulak, 2000–3000 ft, 27.4.1883, *A.Regel* (LE!); Babatag, 13.5.1897, *Korshinsky* (LE!); Kuljab, N'Hänge bei Karatau nahe Dilankur am Fluß Pandzheh, zwischen Kyzyl-su und Aksu, 3000–4000 ft, 8.4.1883, *A.Regel* (LE!); Hissar, Jomut am N'Hang der Berge Gazi-Mailik, 3000 ft, 13.5.1883, *A.Regel* (LE!); Berge Taschbulak, 5000–6000 ft, 29.4.1883, *A.Regel* (LE!); Faizabad, 22.5.1897, *Korshinsky 938* (LE!); Guzar, Tengi-Kharam, 29.4.1897, *Korshinsky* (LE!); Baldzhuan, 3000 ft, V.–VI.1883, *Musa* (in hb. REGEL) (LE!); Sary-Pul, V.–VI.1884, *Musa* (in hb. REGEL); Karategin, Kaschka-terek, 22.6.1897, *Korshinsky*; Karategin zwischen Garm und Nametsch, 20.6.1897, *Korshinsky 1124* (LE!). – **Lectotype** (here designated): Sary-Pul, V.–VI.1884, *Musa* (in hb. REGEL) (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. karatjubeki Golosk. 1950, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 13: 121. – **Lectotype** (here designated): Betpak-dala, litus occ. lacum Balchasch promont. Kara-tjubek, 7.6.1949, *Goloskokov* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. kelifi Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 158. – Syntypes: Kelif, 16. (28.)3.1881, *Capus 342* (LE!, P!); Kokaity, 4.5.1897, *Korshinsky 973*. – **Lectotype** (here designated): Kokaity, 4.5.1897, *Korshinsky 973* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. kelleri Popov 1923, Trudy Turkestansk. Nauchn. Obshch. 1: 36. – Syntypes: prov. Kelif prope Chodsha-Fil-ata, 21.4.1916, *Popov* (LE!); prope Kuhitang, 20.4.1916, *Popov*; in prov. Baissun prope Kisil-Alma, 3.5.1915, *Popov*; Dshisak, 3.5.1921, *Kultiassov 81*. – **Lectotype** (here designated): Dshisak, 3.5.1921, *Kultiassov 81* (LE!).

A. kemulariae Grossh. 1928, in Grossheim & Schischkin, sched. impr. ad Pl. Or. Exsicc. Fasc. 16: 48. – **Lectotype** (here designated): Transcaucasia, Georgia, prov. et distr. Kutais, prope pag. Godaganii, 23.4.1928, *Kemularia* in Pl. Or. exs. ed. Grossheim & Schischkin no. *390* (LE!: the sheet marked as Lectotypus; Iso: LE!, BM!, BP!, K!).

A. kessleri Trautv. 1860, Bull. Soc. Imp. Naturalistes Moscou 33, 1: 496. – **Lectotype** (here designated): in montibus Bektaktu, 2.6.1843, *Schrenk* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!, W!) [more isotypes with locality "e Songaria", *Schrenk* (JE!, P!, W!)].

A. krauseanus Regel 1874, Trudy Imp. S.-Petersburgsk. Bot. Sada 3: 104. – **Lectotype** (here designated): Turkestaniae in montibus Irtaschtsche, 1871, *Krause* (LE!; Iso: MW, P!).

A. kujukensis B.Fedtsch. 1905, Trudy Imp. S.-Petersburgsk. Bot. Sada 24: 225. – **Lectotype** (here designated): [Prov. Syr-Darinsk, Distr. Aulie-ata] bei Kujuka, [Tianschan] V.1881, *Mussa* (LE!: the sheet marked as Lectotypus; Iso: B!, LE!).

A. kukurttavicus Prokh. 1961, Bot. Mater. Gerb. Bot. Inst. Komarova Acad. Nauk SSSR 21: 430. – **Lectotype** (here designated): Daghestania bor., 15 km W Kukurt-Tau, 14.6.1958, *Prokhanov 116* (LE!; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. kulabensis Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 158. – Syntypes: Hissar, Iomud, E'Hang der Berge Gazi-Majlik, 4000–5000 ft 13.5.1883 (blühend), *A.Regel* (LE!); dto., 26.7.1893 (fruchtend), *A.Regel* (LE!); Kuljab, r. Aksu, 2000 ft, 1.6.1883, *A.Regel*; Denau, Sangardak, 20.6.1896, *Lipsky*; Baissun, 6.6.1897, *Lipsky* (LE!). – **Lectotype** (here designated): Kuljab, r. Aksu, 2000 ft, 1.6.1883, *A.Regel* (LE!: the sheet marked as Lectotypus; Iso: B!, BM!, K!, LE!, M!).

A. kuldshensis Bunge 1880, Trudy Imp. S.-Petersburgsk. Bot. Sada 7: 374. – Syntypes: Kuldsha, 1876, *Golicke*; ad fl. Ssary-bulak prope Suidun (am Ili), 24.4.1878, *A.Regel 448* (K!, LE!). – **Lectotype** (here designated): Kuldsha, 1876, *Golicke* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. laceratus Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 144. – Syntypes: Chin. Turkest., Karagol am Passe nach Nilka, 10,000 ft, 5.-17.7.1879, *A.Regel* (LE!); Mengute, 9,000 ft, 20.6.-2.8.1879, *A.Regel*. – **Lectotype** (here designated): Mengute, 9,000 ft, 20.6.-2.8.1879, *A.Regel* (LE!).

A. lagocephalus Fisch. & C.A.Mey. 1844, Bull. Cl. Phys.–Math. Acad. Imp. Sci. Saint-Pétersbourg 2: 197. – Syntypes: desert. songaro-kirghisici inter fluvium Irtysch et montes Arkaul, 18.5., *C.A.Meyer 1105* (LE!, P!); versus montes Ulutau, *Schrenk*; ad fluv. Kara–Kingir et ad fl. Ajagus, *Schrenk 74* (B!, H!, JE!, LE!, MSB!, P!, PR!, PRC!). – **Lectotype** (here designated): versus montes Ulutau, *Schrenk* (LE!: the sheet marked as Lectotypus; Iso: LE!; ZT!: no. *791*).

A. lasiocalyx Gontsch. 1946, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 9: 147. – **Lectotype** (here designated): Tian-schan occ., systema fl. Tczirtczik, in valle Pskem sub trajectu Kurum-dshau, 22.6.1914, *Minkwitz 848* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. lasiophyllus Ledeb. 1843, Fl. Ross. 1: 627. – **Lectotype** (here designated): in littore or. m. Caspii, 1835, *Karelin* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. lasiosemius Boiss. 1849, Diagn. Pl. Or. Nov. 9: 96.
– var. ***leiosemius*** Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 235 – Syntypes: Samarkand. obl.: Pereval Chami-Sukhta, 3.6.1896, *Lipsky* (LE!); Schachrisjabs: Chazret-Sultan, 9000 ft, 4.6.1896, *Lipsky 119* (LE!); Schachrisjabs, Jagna-choda, 9000 ft, 5.6.1896, *Lipsky 118* (LE!); Schachrisjabs, Giljan, 8000 ft, 7.6.1896, *Lipsky 116* (LE!); Kul, 16.6.1896, *Lipsky 117*; Hissar: Subaschi, oberes Fluß Chanaka, 10000 ft, 3.7.1896, *Lipsky 120* (LE!); Darwaz: Arzyng, 19.7.1899, *Lipsky* (LE!); Del. Vangut, 20.7.1899, *Lipsky*; Vereschkaj, Darvas, Khr. Petra B., 12000 ft, 29.7.1899, *Lipsky* (LE! = ? *A. nigrocalyx* Slobodov); R. Tupalang, Pereval Sary-Sotscho, 11.6.1896, *Lipsky*; Samarkand. obl.: Sangidzhaman, 2.6.1896, *Lipsky*; Karategin: Lednik Kapaschibet, 3.8.1896, *Lipsky*. – **Lectotype** (here designated): Kul, 16.6. 1896, *Lipsky 117* (LE!). [the lectotypification by I.DEML 1972 is against the rules because the variety is described in 1907, but the so called type is collected in 1927].

A. leptocaulis Ledeb. 1831, Fl. Altaica 3: 296. – **Lectotype** (here designated): ad rivulum Urmuchaika prope Buchtarminsk, 22.4., *C.A.Meyer* (LE!; Iso: H!).

A. lipskyanus Popov 1928, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 3: 24. – illeg. [non Freyn]. – **Lectotype** (here designated): Tian-schan occid., in valle rivuli Ak-tasch in montibus Karshan-tau, 14.5.1928, *Popov & Vvedensky* in Herb. Fl. As. Med. *358* (LE!: the sheet marked as Lectotypus; Iso: B!, P!, BR!, BRNU!, K!, LE!, MA!, MW, P!, PR!).

A. lithophilus Kar. & Kir. 1842, Bull. Soc. Imp. Naturalistes Moscou 15: 344. – **Lectotype** (here designated): Alatau, ad fontes fluvii Lepsa, *Karelin & Kirilov 279* (LE!: the sheet marked as Lectotypus; Iso: LE!); other isotypes with the nr. *1418* (MW, P!).

A. litwinowianus Gontsch. 1938, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 7: 142. – **Lectotype** (here designated): Tian-Schan, distr. Andizhan, Chazret-ajub, 16.5.1913, *Litwinow* (LE!: the sheet marked as Lectotypus; Iso: LE!) [PODLECH

1988 has indicated holotype and isotype in LE. As up to now no sheet in LE was designated as a holotype a lectotypification is necessary.

A. longistipitatus Boriss. 1936, Trudy Tadzhiksk.. Bazy 2: 165. – **Lectotype** (here designated): Roschan, in faucium Jodudi, 1826–2982 m, 3.8.1897, *Korshinsky 1101* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. macrocladus Bunge 1880, Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ. 26 (2): 293. – **Lectotype** (here designated): Kizil-kum y Tschardary, *O.Fedtschenko* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. macropetalus Schrenk 1844, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg 3: 307. – **Lectotype** (here designated): in collibus versus fluvium Atassu, 17.5. 1843, *Schrenk 451* (LE!: the sheet marked as Lectotypus; Iso: LE: several sheets!, MSB!).

A. macropodium Lipsky 1900, Trudy Imp. S.-Petersburgsk. Bot. Sada 18: 26. – Syntypes: Hissar, ad flum. Varzob, 7.7.1896, *Lipsky 130* (C!, LE!); ad flum. Duob supra Tupalang, 13.6.1897, *Lipsky 132* (LE!); Sakka-khana ad flum. Obi-sarang, 25.6.1896, *Lipsky* (LE!); ad flum. super. Zarchob, 7000 ft, 30.6.1896, *Lipsky 128* (LE!); Denay, Pereval Bakhcha (ad flum. Sangardak), Jakkabag, 7000 ft, 19.7.1896, *Lipsky 127* (LE!); Prov. Samarkand, Bassin Saravschan, Iskander-Kul, 7000 ft, V.1892, *Komarov* (LE!); Pereval Mura, 9000 ft, V.1892, *Komarov* (LE!);Pjandzh-khok ad flum. Eigdi, 7000 ft, 8.7.1896, *Lipsky 131*. – **Lectotype** (here designated): Pjandzh-khok ad flum. Eigdi, 7000 ft, 8.7.1896, *Lipsky 131* (LE!).

A. macropterus DC. 1825, Prodr. 2: 283.
– var. ***australis*** Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 213. – Syntypes: Prov. Samarkand, Gora Naubid, bei Varzaminora, 9.6.1870, *O.Fedtschenko*; Dinrama, am oberen Zaravschan, 8000 ft, 15.8.1881, *A.Regel*; Nasrut, 7000–8000 ft, 3.6.1882, *A.Regel*; Dzhidzhik, 10.-22.6.1881, *Capus*; Varsout,, 20.6.1892, *Komarov*; Pakschif, 7000–10000 ft, 30.6.1893, *Komarov*; Simitsch, nördl. Jagnob, 11.6.1896, *Lipsky* (LE!); Prov. Fergana, Alai, 8100 ft, 22.–23.6.1871, *O.Fedtschenko*; Mündung des Flusses Kok-su, bei Tschak, 1.7.1878, *Skornjakov*; Ters-agar, 1878, *Nevskij*; Schlucht Artschaty, 14.6.1878, *Kuschakewitz*; Daraut-kurgan, 20.6.1895, *Korshinskij*; Pamir, am Fluß Gunt, an der Mündung des Flusses Ljangar-su, 17.8.1897, *Korshinskij*; Indyravitsch am Fluß Gunt, zwischen den Flüssen Airau-su und Kumysch-dzhilga, 16.8.1897, *Korshinskij*; Fluß Terek, am Zufluß des Kara-dari, 29.7.1903, *Lipsky*; am Fluß Gultsch, Kizyl-kurgana, 1800 m, V.1904, *Kronenburg*; Alaijsk. Khrebet, Daraut, 29.6.1904, *B.Fedtschenko*; Zaalijskij Khrebet, Dolina r. Muk, Suuk-Saj, 2.7.1904, *B.Fedtschenko*; unteres Altyn-mazara, 2.7.1904, *B.Fedtschenko*; Denai, Bakhtscha, 4.8.1878, *Nevskij*; Darvaz, Khobu, 8.7.1897, *Lipsky* (C!, H!, LD!, LE!); Odud, Obi-Motraun, 6000–8000 ft, 11.8.1901, *Alexeenko*; Schachrisjabz, Schut, VII.1893, *Komarov*; Schugnan, Tal des Gunt, zwischen Dzhilandy und Vankala, 31.7.1901, *O. & B.Fedtschenko* (LE!); Schugnan, Dzhilandy-Sarchym, 21.7.1901, *O. & B.Fedtschenko* (LE!); Unterlauf des Flusses Abkharva, 3.8.1904, *B.Fedtschenko*; Karategin, Khreb. Petra V., Karaschura, 19.7.1897, *Lipsky* (C!, LE!); Gletscher Oschanino, 29.7.1899, *Lipsky*; Anzob am Fluß Jagnob, 7000 ft, 22.6.1870, *O.Fedtschenko*. – **Lectotype** (here designated): Anzob am Fluß Jagnob, 7000 ft, 22.6.1870, *O.Fedtschenko* (LE!).

A. macrourus Fisch. & C.A.Mey. 1838, Bull. Soc. Imp. Naturalistes Moscou 11: 346. – **Lectotype** (here designated): pr. Tatuni in tr. Suwant, 4500 ft, VI.1836 *Hohenacker 2329* (sub *A. cylindraceus*) (LE!: the sheet marked as Lectotypus; Iso: BP!, G-BOIS!, HBG!, L!, LE!, MSB!, P!; PR!, PRC!, STU!, TUB!, W!, WU!).

A. managildensis B.Fedtsch. 1905, Trudy Imp. S.-Petersburgsk. Bot. Sada 24: 222. – **Lectotype** (here designated): Managildy bis Alabugi, 7000 ft, 4.6.1880, *A.Regel* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. margusaricus Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 164. – Syntypes: Zaravschan. Bassejn, Gory Marguzara, 6000–7000 ft, 27.6.1882, *A.Regel* (LE!); Madm, 5.7.1893, *Komarov* LE!); Kum, 3.7.1893, *Komarov*. – **Lectotype** (here designated): Kum, 3.7.1893, *Komarov* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. maximowiczii Trautv. 1884, Trudy Imp. S.-Petersburgsk. Bot. Sada 9: 379. – **Lectotype** (here designated): in distr. Achalteke Turcomaniae (! secundum distributio) [vel in provincia Karabach Trancaucasiae: the species does not occur in the Caucasus], 1883, *Christoph* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. medius Schrenk 1843, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg 2: 198. – Syntypes: in collibus ad Ters-Akkan, 10.6.1841, *Schrenk* (K!, LE!, W!); necnon in collibus aridis ad fluv. Kara-Kingir , *Schrenk* (K!, LE!, W!) et versus montes Ulutau, *Schrenk*. – **Lectotype** (here designated): versus montes Ulutau, *Schrenk* (LE!: the sheet marked as Lectotypus; Iso: K!, LE!).

A. megalomerus Bunge 1880, Trudy Imp. S.-Petersburgsk. Bot. Sada 7: 379. – Syntypes: in faucibus Ssangi dzhuman, *O.Fedtschenko*; Saratag, *O.Fedtschenko* (LE!); in monte Aksai Turkestaniae austro-occid., *O.Fedtschenko*; in faucibus Buguni jugi Karatau, *Sewerzow*. – **Lectotype**: (Popov 1928 in herbario, here confirmed): in faucibus Buguni jugi Karatau, 17.5., *Sewerzow* (LE!: the sheet marked as Lectotypus; Iso: LE!).
– var. ***longeracemosus*** Basil. 1922, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 3: 120. – **Lectotype** (here designated): Buchara, dol. r. Kitschik-uru, linker Zufluß des Flusses Guzar, 24.5.1913, *Michelson 1875* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. melanocladus Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 272. – **Lectotype** (here designated): Saisan, Gory Saur, between fl. Kendyrlyk and Aba, 12.7.1907, *Rjasnitschenko* 358 (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. melanotrichos Ledeb. 1831, Fl. Altaica 3: 323. – **Lectotype** (here designated): in mont. Kurtschum prope Nabaty ad Irtysch, *Meyer* (LE!: the sheet marked as Lectotypus; Iso: H!, LE!, MSB!, P!).

A. mesites Boiss. & Buhse 1860, Nouv. Mém. Soc. Imp. Naturalistes Moscou 12: 66. – **Lectotype** (here designated): Alyndschathal zwischen Chanaga und Kasantschi, 3100–4200 ft, 22.5.1847, *Buhse 317* (LE!: the sheet marked as Lectotypus; Iso: G-BOIS!, H!, LE!, P!).

A. michelsonii B.Fedtsch. 1921, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 2: 50. – **Lectotype** (here designated): Turkmenistan, Kopet Dag, Kargile-Nuhur, im Gebirge, 22.5.1912, *Michelson 4434* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. michelsonii Gontsch. 1938, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 7:150. – illeg. [non B.Fedtsch.]. – **Lectotype** (here designated): Turcomania, in glareosis fluminis Kuschka, 22.4.1927, *Michelson* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. mirabilis Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 155. – Syntypes: Dolina Dengere, 2000 ft, 3.3.1884, *Mussa* (LE!); Tschorabdara, po r. Kizyl-Su, V.1884, *Mussa*; Sary-Pul, 28.5.1897, *Korshinsky 1118* (LE!) & *1122* (LE!); Talbar, 6500–7700 ft, 30.5.1897, *Korshinsky* (LE!); Berge um Baldshuan, 2.5.1906, *Roshewitz 538* (LE!); Kuljab: Mumynabad, zwischen Kuljab und Baldshuan, IV.1884, *Mussa* (LE!); Bagdy-Saj, 30.4.1906, *Roshewitz 523* (LE!); Darwaz: zwischen Kala-i-Khumon und Sary-daschem, 16.7.1897, *Korshinsky* (LE!); Baldshuan: Baldshuan, 3000 ft, 1883, *Mussa*. – **Lectotype** (here designated): Baldshuan: Baldshuan, 3000 ft, 1883, *Mussa* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. mixtus M.Bieb. 1810, Cent. Pl. Ross. Merid. 1: t. 26. – Syntypes: Bessarabia, prope rivum Gromoklei (LE!); tum ad Borystenem [? in agro Odessano, *Bieberstein* (H!)]; inter Cherson et Berislaw. – **Lectotype** (here designated): inter Cherson et Berislaw (LE!).

A. monadelphus Bunge 1877, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 32. – **Lectotype** (here designated): China prov. Kansu, VII.1872, *Przewalski* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!).

A. mucidus [Bunge ex] Boiss. 1872, Fl. Or. 2: 279. – **Lectotype** (here designated): in jugo Mogol-tau Turkestaniae, *Sewertzow* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!). No specimen in G-BOIS. As no specimen was designated as holotype a lectotypification is necessary.

A. mugosaricus Bunge 1847, Arbeiten Naturf. Vereins Riga 1: 236. – Syntypes: am oberen Kaindi-Bache, 28.5.1842, *Lehmann* (LE!, P!); in den mugosarischen Bergen, 10.6.1841, *Lehmann*.. – **Lectotype** (here designated): in den mugosarischen Bergen, 10.6.1841, *Lehmann* (LE!: the sheet marked as Lectotypus; Iso: G!, H!, LE!). The syntypes were distributed as Reliq. bot. Al. Lehmannii *348* (GOET!, K!, P!).

A. multicaulis Ledeb. 1831, Fl. Altaica 3: 295. – Syntypes: ad fl. Kan, *Bunge*; in deserto Kuraico juxta fl. Tschuja. – **Lectotype** (here designated): in deserto Kuraico juxta fl. Tschuja (LE!: the sheet marked as Lectotypus; Iso: H!, LE!).

A. muschketowi B.Fedtsch. 1899, Bull. Herb. Boiss. 7: 825. – Syntypes: Pamir, loco non indicato, 1899, *N.Welman* (LE!); Pamir, ad lacum Nigrum Magnum (Bolschoi-Karakul), 13000 ft, 22.6.1892, *Nasarow*. – **Lectotype** (here designated): Pamir, ad lacum Nigrum Magnum (Bolschoi Karakul), 13000 ft, 22.6.1892, *Nasarow* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. nigrescens Popov 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 21. – illeg. [non Pall. nec Franch.]. – **Lectotype** (here designated): Turcomania,

Kopet-dagh, Kuschka, Dengli-schor, 4.4.1912, *Lipsky 505* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. nigriceps Popov 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 8. – **Lectotype** (here designated): Turcomania, Gaudan, in monte Kular, 30.5.1898, *Litvinov 1275* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. nikitiniae B.Fedtsch. 1946, in Fl. URSS 12: 888. – Syntypes: Alatau kirghisicus, in montibus Poskeldy, W'slopes, 17.5.1932, *Mavrina* (LE!); Alatau kirghisicus, in montibus Poskeldy, S'slopes, 24.4.1932, *Agafonova*.. – **Lectotype** (here designated): Alatau kirghisicus, in montibus Poskeldy, S'slopes, 24.4.1932, *Agafonova* (LE!).

A. nobilis B.Fedtsch. 1905, Trudy Imp. S.-Petersburgsk. Bot. Sada 24: 236 – Syntypes: V. Ortubel, 15.5.1880, *Mussa* (LE!); St. Basmandinskoe, 1870, *O. Fedtschenko* (LE!); Uratjube, *A.Regel*; zwischen Angren und Kokan, V.1880, *Mussa*. – **Lectotype** (here designated): zwischen Angren und Kokan, V.1880, *Mussa* (LE!).

A. ochranthus Gontsch. 1937, in Fl. Tadzhik. 5: 659. – **Lectotype** (here designated): Kara-tau prope trajectum Kisyl-Kugal inter Dilankur et Saraj, 9.4.1883, *A.Regel* (LE!: the sheet marked as Lectotypus; Iso: LE!, MSB!). As no specimen was designated as holotype a lectotypification is necessary.

A. ochrias Bunge 1877, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 33. – Syntypes: SW Mongolei, Alaschan, *Przewalski 164* (LE!); Mongolia, montibus Muni-ula, *Przewalski 25*.. – **Lectotype** (here designated): Mongolia, montibus Muni-ula, *Przewalski 25* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!).

A. oldenburgii B.Fedtsch. 1936, Trudy Tadshiksk. Bazy 2: 153, reimpr. – Syntypes: ad montem Chodsha-kadian, ad meridiem ab oppido Kabadian, 800–1000 m, 26.4. (7.5.) 1883, *A.Regel* (LE!); Kabadian, Totku, 20 km N opp. Kabadian ad flumen Kafirnigan, 11. (23.) 5.1897, *Korshinsky 1005*. – **Lectotype** (here designated): Kabadian, Totku, 20 km N opp. Kabadian ad flumen Kafirnigan, 11. (23.) 5.1897, *Korshinsky 1005* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. olgae Bunge 1880, Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ. 26(2): 223. – **Lectotype** (here designated): Kokan, Gletscher Shchurovska, 23.6.1891, *O.Fedtschenko* (LE! the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. oligophyllus Schrenk 1844, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg 2: 197. – illeg. [non Boiss.]. – **Lectotype** (here designated): ad septentrionem a fl. Tschu [in deserto Golodnaia step], 22.9.1842, *Schrenk 294* (LE!: the sheet marked as Lectotypus; Iso: G!, LE!, P!).

A. onobrychioides M.Bieb. 1798, Tabl. Prov. Casp.: 117. – gives "A. orientalis canescens, capitulis Trifolii bituminosi, flore dilute purpureo", *Tournefort* cor. 28 in synonymy. – **Lectotype** (here designated), in montibus Schirvanicis, circa Kurt-Bulak, 1796, *Bieberstein* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. oreades C.A.Mey. 1831, Verz. Pfl. Cauc.: 141. – **Lectotype** (here designated): in regione alpina mt. Kasbek, 7200–8600 ft, 27.9.1829, *C.A.Meyer* (LE!: the sheet

marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. ovczinnikovii Boriss. 1937, in Fl. Tadzhik. 5: 655. – **Lectotype** (here designated): in angustiis fl. Bizhun-dara, loco Darbandak, 2400–2500 m, VI.1935, *Ovczinnikov & Aphanassiev 272* (LE!: the sheet marked as Lectotypus; Iso: LE!, MSB!). As no specimen was designated as holotype a lectotypification is necessary.

A. pamiro-alaicus Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 147.
– var. ***mollis*** Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 150. – Syntypes: Samarkand. obl.: Tschap-dara, 11.5.1893, *Komarov*; Kuli-Mohif, 7500 ft, 9.5.1893, *Komarov* (LE!: = *A. sericeopuberulus* Boriss.); Pereval Putkhin, 9000 ft, 24.4.1892, *Komarov* (LE!: = *A. pseudotitovii* Podlech); Anzob, 24.5.1893, *Komarov* (LE!: = *A. sericeopuberulus* Boriss.); Barzengi im oberen Jagnob, 11000 ft, 15.6.1896, *Lipsky* (LE!: = *A. sericeopuberulus* Boriss.); Kuli-Kalon, 9000 ft, V.1893, *Komarov*; The syntypes are heterogeneous. – **Lectotype** (here designated): Kuli-Kalon, 9000 ft, V.1893, *Komarov* (LE!) (so it is = ***A. sericeopuberulus*** Boriss.).

A. paucijugus Schrenk 1844, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg 2: 196. – **Lectotype** (here designated): in ditione ad fluvium Tschu versus, ad fl. Ssaryssu, *Schrenk* (LE!: the sheet marked as Lectotypus; Iso: LE!: sterile, P!).

A. permiensis C.A.Mey. 1850, in Rupr., Fl. Bor. Ural 2: 32, t. II. – **Lectotype** (here designated): ad fl. Wischera, 4.6.1847, *Branth* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. petkoffii B.Fedtsch. 1936, Izv. Bulg. Bot. Druzh. 7: 46. – **Lectotype** (here designated): Pamiro-Alai, reg. Osch prope Gulcza, 24.5.1900, *Tranzschel* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. petunnikovii Litv. 1905, Spisok Rast. Gerb. Russk. Fl. Bot. Muz. Rossijsk. Akad. Nauk 5: 76. – **Lectotype** (here designated): Turkestania, pr. Farab (ad fl. Amu-darja), 4.5. (flor.) et 2.6.1903 (fruct.), *Androssov & Kelow* in Herb. Fl. Ross. *1410* (LE!: the sheet marked as Lectotypus; Iso: B!, BM!, BP!, C!, G!, H!, LE!, MW, PRC!, WU!).

A. physocalyx Fisch. 1837, Bull. Sci. Acad. Imp. Sci. Saint-Pétersbourg 2: 74. – **Lectotype** (here designated): Philippopolis, Rumelia, *Frivaldsky* (LE!: the sheet marked as Lectotypus; Iso: B!, BP!, G-BOIS!, GOET!, LE!, PRC!, W!, WU!).

A. physocalyx Kar. & Kir. 1841, Bull. Soc. Imp. Naturalistes Moscou 14: 409. – illeg. [non Fisch.]. – **Lectotype** (here designated): ad fl. Uldschar, montes Tarbagatai, *Karelin & Kirilov 256* (LE!: the sheet marked as Lectotypus; Iso: K!, LE!, P!); more isotypes were distributed with nr. *204* (BM!, BR!, G!, H!, LE!, MSB!, MW, P!, W!).

A. physocarpus Ledeb. 1831, Fl. Altaica 3: 335. – Syntypes: ad fl. Schulba, Buchtorma et Dscharguban, *Schangin & Sievers* (ex Pallas); circa Loktevsk, *Bunge*. – **Lectotype** (here designated): circa Loktevsk, *Bunge* (LE!).

A. platyphyllus Kar. & Kir. 1842, Bull. Soc. Imp. Naturalistes Moscou 15: 345. – **Lectotype** (here designated): Alatau ad fl. Lepsa et Sarchan, *Karelin & Kirilov 281* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!); more isotypes were distributed

with nr. *1414* (BM!, G!, H!, K!, LE!, MSB!, MW, P!, W!).

A. podocarpus C.A.Mey. 1831, Verz. Pfl. Cauc.: 142. – **Lectotype** (here designated): Talish prope Suwant, 20.6.1830, *C.A.Meyer* (LE!: the sheet marked as Lectotypus; Iso: E!, H!, K!, LE!, P!, W!).

A. polytimeticus Popov 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 12. – **Lectotype** (here designated): Pamiro-Alaj, in viciniis lac. Kuli-kalon, 2570 m, 12.6.1892, *Komarov* (LE!; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. protractus Boriss. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 45. – **Lectotype** (here designated): Kopet-dagh, distr. Ashkhabad, supra Janap, 12.6.1934, *Androssov* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. przewalskii Bunge 1878, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 32. – **Lectotype** (here designated): China, Prov. Kansu, regio alpina jugi secus fl. Tatung, 10.–24.7.1872, *Przewalski 263* (LE!; Iso: P!).

A. pseudanthylloides Gontsch. 1941, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 9: 101. – **Lectotype** (here designated): Usbekistan pr. Baissun, 1300 m, 5.6.1897, *Lipsky* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. pseudoamygdalinus Popov 1937, in Fl. Tadzhik. 5: 661. – **Lectotype** (here designated): Tian-schan, mt. Kuramenses, 27.7.1935, *Emme-Markovskaja 515* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. pseudoaustralis Fisch. & C.A.Mey. 1843, Ind. Sem. Hort. Petrop. 11, Suppl.: 16. – T: Mt. Altai, pr. Riddersk, *C.A.Meyer*. – **Neotype** (here selected): prope pag. Riddersk, 1845, *Politoff* (LE!). No specimen of C.A.MEYER could be found at LE. Therefore a Neotyp was selected.

A. pseudolanuginosus Gontsch. 1937, in Fl. Tadzhik. 5: 657. – **Lectotype** (here designated): in valle Alaj, Ajgir-dzhol, 26.6.1913, *Desjatova 1412* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. pseudonobilis Popov 1928, Trudy Sredne-Aziatsk. Gosud. Univ., Ser. 8b, Bot. 3: 30. – **Lectotype** (here designated): Tian-schan occ., mt. Spa in Mogol-tau, 15.6.1928. *Popov* in Herb. Fl. As. Med. *364* (LE!: the sheet marked as Lectotypus; Iso: B!, BR!, BRNU!, C!, LE!, MW, P!, W!).

A. pseudorhacodes Gontsch. 1941, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 9: 103. – **Lectotype** (here designated): Pamiro-Alaj australis, jug. Babatag contra pag. Akmeczet, in valle sicco fluminis Czarraga, 750 m, 4.6.1938, *Linczevski 267* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. psilopus Schrenk 1842, Bull. Sci. Acad. Imp. Sci. Saint-Pétersbourg 10: 254. – Syntypes: Flugsandsteppen am Emul unweit der Mündung im Alatau, 29.6.1841,

Schrenk (LE!); sandige Steppen am Alakul, 28.6.1841, *Schrenk*. – **Lectotype** (here designated): sandige Steppen am Alakul, 28.6.1841, *Schrenk* (LE!; Iso: BR!, W!).

A. pskemensis Popov 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 13. – **Lectotype** (here designated): in systema fl. Pskem, ad fontes fl. Ispai, 31.8.1928, *Popov & Smirnowa* (LE!: c. fruct.; Iso: LE!: c. flor.). As no specimen was designated as holotype a lectotypification is necessary.

A. puberulus Ledeb. 1831, Fl. Altaica 3: 299. – Syntypes: Tschuja, *Bunge* (LE!); ad fl. Ursul. – **Lectotype** (here designated): ad fl. Ursul, *Bunge* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. pycnolobus Bunge 1835, Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savants 2: 594.– Verz. Pfl. Altai-Geb.: 95. 1836. – Syntypes: ad fluvium Kurtschum, 1832, *Bunge* (P!); prope metallofodinam Syrianowsk, *Bunge*. – **Lectotype** (here designated): prope metallofodinam Syrianowsk, *Bunge* (LE!: the sheet marked as Lectotypus; Iso: H!, LE!, P!).

A. raddeanus Regel 1865, Ind. Sem. Hort. Petrop. 1865: 40. – **Lectotype** (here designated): Gruzia, Borshom, 5.6.1865, *Radde* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!).

A. refractus C.A.Mey. 1831, Verz. Pfl. Cauc.: 144. – **Lectotype** (here designated): Talisch pr. Suwant, *Meyer* (LE!: the sheet marked as Lectotypus; Iso: G-BOIS!, LE!, P!).

A. regelii Trautv. 1873, Trudy Imp. S.-Petersburgsk. Bot. Sada 2: 472. – **Lectotype** (here designated): in Armenia, prope pagum Belaw, 17.6.1871, *Radde* (LE! the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. roschanicus B.Fedtsch. 1937, in Fl. Tadzhik. 5: 673. – **Lectotype** (here designated): [Tadzhikistan] Darwaz, prope Kalai-Rocharw ad fl. Vancz, 8.6.1897, *Korshinsky 957* (LE! the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. roseus Ledeb. 1831, Fl. Altaica 3: 330. – Syntypes: ad fl. Irtysch (prope Ustkamenogorsk) (PRC!), Kurtschum, Bekun et alibi in deserto soongoro-kirghisico, *Meyer*; circa metallifodinas Loktewsk, Nikolajew etc. – **Lectotype** (here designated): Kurtschum, *C.A.Meyer* (LE!) [all other specimens of LEDEBOUR in LE are without locality].

A. rostratus C.A.Mey. 1831, Verz. Pfl. Cauc.: 144. – **Lectotype** (here designated): Talisch, prope Suwant, alt. 670 hexap., 20.6.1830, *C.A.Meyer* (LE!: the sheet marked as Lectotyus; Iso: G-BOIS!, LE!).

A. rubtzovii Boriss. 1950, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 13: 127. – **Lectotype** (here designated): Kazakhstan, ad fl. Kegen, in arena Kum-tekei, 30.6.1946, *Rubtzov* (LE!: Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. ruprechtii Bunge 1868, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 101 et l.c. 15 (1): 174. 1869. – Syntypes: prope Besobdal, *Eichwald*; Caucasus or., supra Gimri,

3000–5500 ft, 11.6.1861, *Ruprecht*. – **Lectotype** (here designated): Caucasus or., supra Gimri, 3000–5500 ft, 11.6.1861, *Ruprecht* (P!; Iso: LE!).

A. rytilobus Bunge 1880, Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ. 26(2): 209. – Syntypes: prope Taschkent, 15.4.1871, *O.Fedtschenko* (LE!); Taschkent, near Bossu, 11.4.1871, *O.Fedtschenko* (LE!); Taschkent, *Sadovskij;* dto., *Sewertzow*; dto., circa Minj Urjuk, *Krause* (LE!); bei Samarkand, 17.4., *Fedtschenko* (LE!); Katty-Kurgan, 9.5., *Fedtschenko* (LE!); fl. Narupai, pr. Katty-Kurgan,, 28.4., *Fedtschenko* (LE!); Dzhama, 24.4., *Fedtschenko* (LE!); Daula, 24.4., *Fedtschenko* (LE!); inter Ulusa et Dzham, 1869, *Fedtschenko*. – **Lectotype** (here designated): inter Ulusa et Dzham, 1869, *Fedtschenko* (LE!).

A. sabuletorum Ledeb. 1831, Fl. Altaica 3: 321. – **Lectotype** (here designated): ad fl. Irtysch et Bekun, 3.5.1828, *C.A.Meyer* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!, PRC! – C! & GOET! sent by LEDEBOUR without locality but probably isotypes)

A. saccocalyx Schrenk 1841, in Fischer & C.A.Meyer, Enum. Pl. Nov. 1: 83. – **Lectotype** (here designated): in promontorio montium Labassy, 14.6.1840, *Schrenk* (LE!: the sheet marked as Lecotypus; Iso: LE!, P!).

A. sachalinensis Bunge 1868, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 23 et l.c. 15(1): 26. 1869. – **Lectotype** (here designated): Sachalin prope pagum Adngi-wo, *Schmidt* (P!; Iso: LE!).

A. saganlugensis Trautv. 1858, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg 16: 323. – **Lectotype** (here designated): In Turcia asiatica, inter montes saganlugenses et Arserum [Erzerum], 19.8.1855, *Lagowski* (LE!: the sheet marked as Lectotypus; Iso: G-BOIS!, LE!).

A. salicetorum Kom. 1914, Repert. Spec. Nov. Regni Veg. 13: 230. – **Lectotype** (here designated): in valle fluvii Kamtshatka in insula Monastyrskij prope Kliutshi, VII.1909, *Bezais 4387* (LE!; Iso: LE!: no. *4386*). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. salsugineus Kar. & Kir. 1842, Bull. Soc. Imp. Naturalistes Moscou 15: 341. – **Lectotype** (here designated): in salsi Songoriae ad rivulum Ai, *Karelin & Kirilov 273* (LE!: the sheet marked as Lectotypus; Iso: LE!, other isotypes with nr. *1382* (BM!, BR!, G!, H!, K!, LE!, M!, MW, P!, W!, WU!).

A. saratagius Bunge 1880, Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ. 26(2): 269. – Syntypes: Kokan bei Dzhityk, 22.6.1871, *O.Fedtschenko* (LE!); Saratag beim Iskander-Kul, 16.6.1871, *O.Fedtschenko*. – **Lectotype** (here designated): Saratag beim Iskander-Kul, 16.6.1871, *O.Fedtschenko* (LE!).

A. sarawschanicus Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 169. – Syntypes: Prov. Samarkand, Zaravshan. Bass., gory N Kschtut, 4000–7000 ft, 17.6.1882, *A.Regel* (LE!); zwischen Guzar und Kschtut, 3000–4000 ft, 18.6.1882, *A.Regel*; Pendzhikent, 3200 ft, V.1892, *Komarov* (LE!); Schink am Fluß Mogian, 4300 ft, 29.5.1892, *Komarov* (LE!); Mogian, V.1892, *Komarov* (LE!); Rewat, 7.7.1893, *Komarov*. – **Lectotype** (here designated): Rewat, 7.7.1893, *Komarov* (LE!).

A. sarypulensis B.Fedtsch. 1936, Trudy Tadshiksk. Bazy 2: 150. – Syntypes: ad pagum Arsangi, 14.5.1910, *Divnogorsky* (LE!); Decliv. septentr. jugi Darwasici ad pag. Sarypul, 8.5.1913, *Michelson 1444*. – **Lectotype** (here designated): Decliv. septentr. jugi Darwasici ad pag. Sarypul, 8.5.1913, *Michelson 1444* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. satteotoichos Gontsch. 1946, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 9: 140. – **Lectotype** (here designated): Pamiro-Alaj, jug. Kiczik-teraj distr. Kulab, supra pag. Turkoni, 13.6.1935, *Gontscharov, Linczevski & Maslennikova 327* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. scaberrimus Bunge 1833, Enum. pl. China bor.: 17; et in Mém. Acad. Imp. Sci. St.-Pétersbourg Divers Savants 2: 91. – **Lectotype** (here designated): prope Pekinum, IV.1831, *Bunge* (LE!: the sheet marked as Lectotypus; Iso: H!, LE!, P!).

A. schachdarinus Lipsky 1910, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 181. – **Lectotype** (here designated): ad fl. Schach-dara, beim Dorf Mazar prov. Schugnan, 24.6.1897, *Korshinsky 932* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. schachimardanus Basil. 1922, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 3: 115. – **Lectotype** (here designated): Prov. Fergana, Distr. Skobelevskij, Alaijsk. khreb., Tal des Flusses Schachimardan, Schlucht Arpa, 22.5.1916, *Drobov 1031* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. schelichowii Turcz. 1840, Bull. Soc. Imp. Naturalistes Moscou 13: 68. – Syntypes (or better all isotypes: ad viam Ochotensem (= inter Helan et Ochotho, *Schelichow* (H!); vel inter Jacuti et Ochoteam [inter Jakutsk et Ochotsk], 1835, *Schelichow*. – **Lectotype** (here designated): inter Jacuti et Ochoteam (LE!: the sheet marked asl Lectotypus; Iso: G!, H!, K!, LE!, M!, P!).

A. scheremetevianus B.Fedtsch. 1902, Trudy Bot. Muz. Imp. Akad. Nauk 1: 125. – Syntypes: von Dzhilandy nach Vankala, 11–12000 ft, 21.7.1901, *B.Fedtschenko* (B!, LE!); Dol. r. Toguz-bulak, Pereval Koj-tezeka, nr. Dzhilandy, 20.7.1901, *B.Fedtschenko*. – **Lectotype** (here designated): Dol. r. Toguz-bulak, Pereval Koj-tezeka, nr. Dzhilandy, 20.7.1901, *B.Fedtschenko* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. schrenkianus Fisch. & C.A.Mey. 1844, Bull. Cl. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg 2: 197. – **Lectotype** (here designated): Arganaty Berge, Hügelland am Ters-Akkan, 27.5.1840, *Schrenk 776* (LE!: the sheet marked as Lectotypus; Iso: BM!, GOET!, LE!, ZT!).

A. schugnanicus B.Fedtsch. 1902, Trudy Bot. Muz. Imp. Akad. Nauk 1: 124. – **Lectotype** (here designated): Dol. r. Gunt, zwischen Rivak und Vankala, 9000 ft, 30.7.1901, *B.Fedtschenko* (LE!: the sheet marked as Lectotypus; Iso: B!: foto MSB!, LE!).

A. scleropodius Ledeb. 1831, Fl. Altaica 3: 326. – **Lectotype** (here designated): in mont. Kurtschum prope munimentum Baty ad fl. Irtysch, 10.6.1826, *C.A.Meyer* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!).

A. scleroxylon Bunge 1847, Arbeiten Naturf. Vereins Riga 1: 241. – Syntypes: bei Bakali, 26.4.1842, *Lehmann*; et 28.4.1842, *Lehmann*. – **Lectotype** (here designated): bei Bakali, 28.4.1842, *Lehmann* (P!;). The syntypes were distributed as: Reliqu. bot. Al. Lehmann. *359* (G-BOIS!, LE!, W!).

A. scoparius Schrenk 1841, in Fischer & C.A.Meyer, Enum. Pl. Nov. 1: 82. – **Lectotype** (here designated): in promontorio montium Alatau, 23.6.1840, *Schrenk* (LE!: the sheet marked as Lectotypus; Iso: BM!, LE!, P!, W!).

A. setosulus Gontsch. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 33. – **Lectotype** (here designated): Tauria, in monte Demerdshi, in vic. opp. Aluschta, 25.7.1894, *Alexeenko* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. shishkinii Grossh. 1928, in Grossheim & Schischkin, in schedis impr. ad Pl. Or. Exsicc. (ed. GROSSHEIM & SCHISCHKIN) Fasc. 11: 18. – **Lectotype** (here designated): Transcaucasica, Georgia, Tiflis, prope Mtzchet, 20.5.1923, *Schischkin* in Pl. Or. Exs. no. *266* (LE!: the sheet marked as Lectotypus; Iso: BM!, G!, K!, LE!, Z!).

A. skorniakowii B.Fedtsch. 1905, Trudy Imp. S.-Petersburgsk. Bot. Sada 24: 227. – Syntypes: Managildy do Alabugi, 6000–7000 ft, 4.6.1880, *A.Regel* (LE!); Arasan, 7000–11000 ft, 8.5., *Fetissov*. – **Lectotype** (here designated): Arasan, 7000–11000 ft, 8.5., *Fetissov* (LE!).

A. sogdianus Bunge 1880, Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ. 26 (2): 268. – Syntypes: Mogol-Tau, 3000 ft, *Sewertzow*; Dzhizmanskom, 2.5., *O.Fedtschenko*. – **Lectotype** (here designated): Dzhizmanskom, 2.5., *O.Fedtschenko* (LE!).

A. sogotensis Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 178. – **Lectotype** (here designated): Semirtsch. obl., Sogoty [Fl. Iliensis], 29.5.1886, *Krassnov* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. songoricus Gontsch. 1938, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 7: 152. – illeg. [non Pall.]. – **Lectotype** (here designated): Montes Alatau songorici, Distr. Kopal, inter Altyn-Emel et Kugaly, 15.6.1909, *Lipsky 3145* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. spartioides Kar. & Kir. 1842, Bull. Soc. Imp. Naturalistes Moscou 15: 330. – **Lectotype** (here designated): Songoria, inter fontem Tschingildy et fluv. Lepsa, *Karelin & Kirilov 248* (LE!: the sheet marked as Lectotypus; Iso: LE!) – more isotypes with nr. *1411* (BM!, BR!, G!, H!, K!, LE!, M!, MSB!, MW, P!, W!, WU!) and Herb. Fl. Ross. *1409* (C!, LE!).

A. sphaerocystis Bunge 1852, Beitr. Fl. Russl.: 97. – **Lectotype** (here designated): Dzhabyk in Mt. Alatau, Juli 1842, *Schrenk 722* (LE!: the sheet marked as Lectotypus; Iso: LE!, P!).

A. sphaerophysa Kar. & Kir. 1842, Bull. Soc. Imp. Naturalistes Moscou 15: 338. – Syntypes: inter mont. Arganaty et Dschiss-ahatsch ad fl. Ajagus, VIII.1841, *Karelin & Kirilov* (*267*); Songoria inter mont. Arganaty et fontem Sassyk-pastau, VI.1841, *Karelin & Kirilov*. – **Lectotype** (here designated): Songoria inter mont. Arganaty et

fontem Sassyk-pastau, VI.1841, *Karelin & Kirilov* (LE!). The syntypes were distributed with nr. *1410* (BM!, BR!, G!, LE!, M!, P!, W!).

A. spinulosus Basil. 1922, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 3: 118. – **Lectotype** (here designated): Syr-Dar. obl., Tschimkent. u., Kelen-Kurgan, 30.6.1908, *Knorring 792* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. spryginii Popov 1915, in Dimo, Soil Invest. Exped. Rivers Syr-daria & Amu-daria, Pt. 1: 51 et in Bjull. Sredne-Aziatsk. Gosud. Univ. 7, Suppl.: 18. 1924. – **Lectotype** (here designated): Mogoltau, Utsch-tjube-bulak, 16.4.1914, *Popov 887* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. stenocarpus Gontsch. 1946, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 9: 143. – **Lectotype** (here designated): Pamiro-Alaj occ., Distr. Schahrisjabs, sub trajectum Mula, 1640 m, 16.6.1896, *Lipsky* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. stenoceras C.A.Mey. 1841, in Bongard & Meyer, Verz. Pfl. Saisang-Nor: 23. – **Lectotype** (here designated): ad lacum Saisang-Nor, *Politoff* (LE!: the sheet marked as Lectotypus; Iso: LE!, PRC!).

A. stenoceroides Boriss. 1938, Bot. Mater. Gerb. Bot. Inst. Akad. Nauk SSSR 7: 232. – **Lectotype** (here designated): Schugnan, ad Chorog, 28.5.1935, *Ovczinnikov & Afannasjiev 23* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. stenocystis Bunge 1880, Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ. 26(2): 301. – **Lectotype** (here designated): Dzhizmana Turkestaniae, 1869, *O.Fedtschenko* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. stevenianus DC. 1825, Prodr. 2: 285.
– var. ***multijugus*** Trautv. 1869 , Trudy Imp. S.-Petersburgsk. Bot. Sada 1: 17 – Syntypes: in territorio Swant, prope Diabar, V.1870, *Radde* (LE!); et in itinere versus Barnasar, V.1870, *Radde*. – **Lectotype** (here designated): in itinere versus Barnasar, V.1870, *Radde* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. subarcuatus Popov 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 4. – **Lectotype** (here designated): Mugodshary, prope stat. Ber-Czugur, 24.9.1909, *Androssov* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. suidunensis Bunge 1880, Trudy Imp. S.-Petersburgsk. Bot. Sada 7: 378. – Syntypes: Ili-Ufer Kuldscha, 3.5.1877, *A.Regel 163* (C!, LE!); Koibinschlucht N des Ili zwischen Suidun und Ili, 1.4.1877, *A.Regel 380* (LE!, P!); am Talki bei Suidun, *A.Regel* (LE!); Kuldsha, VII.1877, *Regel* (LE!, W!); Aktübe, *A.Regel*; Ili-Ufer S Kuldsha, 30.6.1877, *A.Regel* (LE!); Station Bajandai oder Langar, 2000, 5.5.1878, *A.Regel*. – **Lectotype** (here designated): Bajandai, 2000 , 5.5.1878, *A.Regel* (LE!).

A. surchobi Gontsch. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 39. – **Lectotype** (here designated): Pamiro-Alaj, Karategin prope pag. Kaschka-

Terek, 22.6.1897, *Korshinsky 1111* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. tanguticus Batalin 1891, Trudy Imp. S.-Petersburgsk. Bot. Sada 11: 485. – **Lectotype** (here designated): China, Kansu, ad fluv. Myn-dan-scha, 29.5.1890, *Grum-Grshimailo* (LE!; Iso: K!). [The remark "specimen unicum" in the original description has caused WENNINGER 1991 to think the holotype is at K. As the original herbarium of GRUM-GRISHMAILO is at LE, the lectotype will be chosen from this herbarium].

A. taschkendicus Bunge 1880, Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ. 26(2): 280. – Syntypes: prope Taschkent, 17.5., *Kuschakewicz* (LE!); Zerawschan, pereval (Paß) Kyzyl-kutal. 13.5.1869, *O.Fedtschenko* (LE!); et prope Dzhizmansk, 13.5.1869, *O.Fedtschenko*. – **Lectotype** (here designated): prope Dzhizmansk, 13.5.1869, *O.Fedtschenko* (LE!).

A. tashkutanus Nikitin 1950, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 12: 121. – **Lectotype** (here designated): Hissar occid., inter trajectum Poschmikuna et pagum Kirghizsky ad fl. Schirkent-darja prope mt. Tashkutan, 2200 m, 8.8.1946, *Nikitin 22* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. tenuis Turcz. 1842, Bull. Soc. Imp. Naturalistes Moscou 15: 768 et in Fl. Baic.-Dahur. 1: 324. 1842–1845. – Syntypes ?: Dahuria ad limites Chinenses ?; inter Sochtui et Altangan. – **Lectotype** (here designated): [in siccis Dahuriae Nerczinensis, 1831], *Turczaninov* (LE!: the sheet marked as Lectotypus; Iso: LE!, M!).

A. tephrolobus Bunge 1868, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 127 et l.c. 15(1): 222. 1869. – **Lectotype** (here designated): ad Tschujam in jugo altaico orientaliore, *Politoff* (P!; Iso: G!, LE!, MSB!).

A. trachycarpus Gontsch. 1937, in Fl. Tadzhik. 5: 672. – **Lectotype** (here designated): jug. Kiczik-Terjaj E Kulab, loco Kok-tasch haud procul a pag. Turkoni, 1370 m, 15.6.1935, *Gontscharov & al. 363* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. tranzschelii Boriss. 1936, Trudy Tadzhiksk. Bazy 2: 167. – **Lectotype** (here designated); Prov. Ferghana, distr. Osch, ad glacies Mus-dagh, in jugo Transalaico, ad fontes fl. Kisyl-su orient., 18.7.1900, *Tranzschel* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. trichocalyx Trautv. 1876, Trudy Imp. S.-Petersburgsk. Bot. Sada 4: 362. – illeg. [non Torr. & Gray]. – **Lectotype** (here designated): Achalzich, prope Abastuman, 1845, *Radde* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

A. tscharynensis Popov 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 9. – **Lectotype** (here designated): prope Sogoty, 1886, *Krassnov* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. tshegemensis Galushko 1970, Novosti Sist. Vyssh. Rast. 6: 214. – **Lectotype** (here designated): Caucasus borealis, Tshegem, pr. pag. Verchnyi Tshegem, 6.8.1965, *Galushko* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen at LE was designated as holotype a lectotypification is necessary.

A. tulinovii O.Fedtsch. 1903, Fl. Pamir: 27. – Syntypes: zw. Chodzha-Nasar und Pereval Koj-Tezek, 13000–14000 ft, 20.7. (blüh.); zw. Ozero Sassyk und Jaschil, 11000–12000 ft, 17.7., *O. & B.Fedtschenko* (LE!). – **Lectotype** (here designated): zw. Chodzha-Nasar und Pereval Koj-Tezek, 13000–14000 ft, 20.7. (blüh.), *O.Fedtschenko* (LE!).

A. turczaninovii Kar. & Kir. 1842, Bull. Soc. Imp. Naturalistes Moscou 15: 342. – **Lectotype** (here designated): Songoria inter montes Arganaty et fontem Sassykpastau, *Karelin & Kirilov 275* (LE!; Iso: P!): more isotypes with nr. *1393* (BM!, BR!, G!, H!, K!, LE!, M!, MSB!, MW, P!, W!, WU!) and Herb. Fl. Ross. *1866* (G!, H!, LE!, PRC!, WU!).

A. turkestanus [Bunge ex] Boiss. 1872, Fl. Or. 2: 278. – **Lectotype** (here designated): Tadzhikistan, Mogol-Tau, 29.4., Sewertzow (LE!: the sheet marked as Lectotypus; Iso: LE!, P!). No specimen in G-BOIS.

A. uliginosus L. 1753, Sp. Pl.: 757.
– var. ***kamtschaticus*** Kom. 1929, Fl. Kamtschatki 2: 281 – **Lectotype** (here designated): [non explicite designatus] Kamtschatka, in valle riv. Kamtschtka pr. pag. Scharoma, 26.6.1909, *Komarov 2834* (LE!: the sheet marked as Lectotypus; Iso: MW, LE!).

A. unilateralis Kar. & Kir. 1841, Bull. Soc. Imp. Naturalistes Moscou 14: 404. – **Lectotype** (here designated): Soongoro-Kirghis. prope Arkalyk, *Karelin & Kirilov 189* (LE!: the sheet marked as Lectotypus; Iso: BM!, BR!, G!, H!, K!, LE!, M!, MW, P!, W!, WU!).

A. urgutinus Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 179. – Syntypes: [Schlucht] Dzham, 13.5.1869, *O.Fedtschenko* (LE!); Urgut, 21.5.1892, *Komarov* (LE!); Amman-Kutan, 1.6.1897, *Lipsky*; Sangi-dzhaman, 2.6.1896, *Lipsky* (LE!); Gizhdevan, 1.6.1896, *Lipsky* (LE!). – **Lectotype** (here designated): Amman-Kutan, 1.6.1897, *Lipsky* (LE!: the sheet marked as Lectotypus; Iso: LE!).

A. vandshinus Lipsky 1907, Trudy Imp. S.-Petersburgsk. Bot. Sada 26: 128. – **Lectotype** (here designated): Darwas, Kala-i-Rokhar ad fl. Vandsh, 8.6.1897, *Korshinsky* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. variabilis Bunge 1877, Bull. Acad. Imp. Sci. Saint-Pétersbourg 24: 33. – Syntypes: Mongolia, ad fl. Hoang-ho, IV.–V.1872, *Przhevalski 34* (LE!); nec non ad pedem jugi Alaschan, V.–VI.1872, *Przhewalski 90* (LE!, K!, P!); dto., 1.-20.6.1873, *Przhevalski 73*. – **Lectotype** (here designated): ad pedem jugi Alaschan, 1.-20.6.1873, *Przhewalski 73* (LE!; Iso: K!, P!).

A. velatus Trautv. 1886, Trudy Imp. S.-Petersburgsk. Bot. Sada 9: 450. – **Lectotype** (here designated): Turcomania, Kisil Arwat, Achal-Tekke, 1883, *Becker* (LE!: the sheet marked as Lectotypus; Iso: G!, JE!: without flowers or fruits, LE!).

A. vicioides Ledeb. 1831, Fl. Altaica 3: 301
– var. ***longipes*** Trautv. 1860, Bull. Soc. Imp. Naturalistes Moscou 33(1): 499. – Syntypes: in montibus Dshabyk Songoriae, 14.7., *Schrenk*; in pylis Kuhlasu, 10.7., *Schrenk* (LE!: in sect. world); in tractu Tschegarak Assu, 21.6., *Schrenk*. – **Lectotype** (here designated): in montibus Dshabyk Songoriae, 14.7., *Schrenk* (LE!; Iso: P!).

A. virgeus Boriss. 1947, Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk SSSR 10: 47. – **Lectotype** (here designated): Turcia, distr. Artvin, ad ripam Czoroch, 9.6.1914, *Turkevicz 745* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. wachschii B.Fedtsch. 1936, Trudy Tadshiksk. Bazy 2: 151. – **Lectotype** (here designated): Kurgan-tube, ad flumen Wachsch supra Kurgan-tube, 350–500 m, III.1884, *A.Regel* (LE!: the sheet marked as Lectotypus; Iso: LE!). As no specimen was designated as holotype a lectotypification is necessary.

A. winkleri Trautv. 1886, Trudy Imp. S.-Petersburgsk. Bot. Sada 9: 449. – **Lectotype** (here designated): Kisil-Arwat, Achal-Tekke, 1883, *Becker 96* (LE!: the sheet marked as Lectotypus; Iso: G!, LE!).

A. xanthotrichos Ledeb. 1831, Fl. Altaica 3: 324. – **Lectotype** (here designated): mont. Kurtschum, *C.A.Meyer* (LE!: the sheet marked as Lectotypus; Iso: LE!, GOET: without locality, M!) [probably isotype: Irtysch, *C.A.Meyer* (P!)].

A. xylorrhizus Bunge 1880, Izv. Imp. Obshch. Ljubit. Estestv. Moskovsk. Univ. 26 (2): 267. – Syntypes: Turkestan, Gor Dolon, Schlucht Otschtschuka, IV.1872, *Korovin*; Buamsko Urtatokoj, *Korovin*; Tal des Tschu und Kutmoddy, *Korovin*. – **Lectotype** (here designated): Turkestan, Gor Dolon, Schlucht Otschtschuka, IV.1872, *Korovin* (LE!).

Phaca macrostachys Turcz. 1840, Bull. Soc. Imp. Naturalistes Moscou 13: 66. – **Lectotype** (here designated): in montosis Mongoliae Chinensis, 1831, *Turczaninov* (LE!: the sheet marked as Lectotypus; Iso: LE!). As in LE no sheet is designated as holotype a lectotypification is necessary.

Phaca trigonocarpa Turcz. 1842, Bull. Soc. Imp. Naturalistes Moscou 15: 761. 1842. – **Lectotype** (here designated): ad fl. Barguz, 1832, *Turczaninov* (LE!; Iso: BR!, P!).

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Bemerkungen zu Astragalus L. sect. Tricholobus Bunge (Fabaceae)

S. TIETZ

Zusammenfassung:
TIETZ, S.: Bemerkungen zu Astragalus L. sect. Tricholobus Bunge (Fabaceae). – Sendtnera 3: 177–186. 1996. – ISSN 0944–0178.

Von den bisher zu sect. *Tricholobus* gestellten Arten werden vier in die Synonymie des *A. tricholobus*, eine davon in die Stellung einer Unterart verwiesen. Von den verbleibenden zwei Arten werden genaue Beschreibungen und Verbreitungsangaben gemacht. Dabei wird der enge Bezug zu den Nachbarsektionen *Campylanthus* und *Microphysa* herausgestellt.

Abstract:
The present paper comprises detailed descriptions, complete lists of synonyms and a distribution map for the two species of the sect. *Tricholobus*. The species are closely related to the sect. *Campylanthus* and *Microphysa*. Four species are found to be synonyms of *A. tricholobus*, one species is changed into the rank of a subspecies.

Probleme der Sektionsabgrenzung

Die vorliegende Arbeit ist die Fortsetzung von Revisionen im Verwandtschaftskreis basifix behaarter, dorniger *Astragali* mit blasigem Fruchtkelch und unilokulärer Frucht (TIETZ 1988; TIETZ & ZARRE 1994). An dieser Stelle möchte ich mich bei Herrn Prof. Dr. D. Podlech für die Übertragung des Themas und Materials wie auch für viele wertvolle Anregungen ganz besonders bedanken, ebenso bei Herrn Sh. Zarre für wichtige Hinweise über die Pflanzen am Standort.

BUNGE begründete 1868 die Sektion auf dem von FISCHER 1853 aufgestellten Verwandtschaftskreis *Tricholobi*, wobei er *A. ebenoides* ausschloß. In der Sektion verblieben nur *A. tricholobus* und *A. hohenackeri*, die in vorliegender Arbeit als Unterarten des recht variablen *A. tricholobus* zusammengefaßt werden. Alle weiteren im Laufe der Zeit beschriebenen Arten gehören bis auf *A. magistratus* ebenfalls zu dieser Art. BUNGE unterscheidet die sect. *Tricholobus* von der sect. *Campylanthus* v.a. durch die von oben zusammengedrückten Früchte. Solche Früchte kommen jedoch auch in der sect. *Campylanthus* vor. Außerdem erinnern die Fruchtkelche und Kronblätter, v.a. die der kleinblütigen subsp. *hohenackeri*, an sect. *Campylanthus*. Lediglich die vorne nicht spitze Schiffchenplatte ist abweichend.

Auch *A. magistratus* erinnert an die sect. *Campylanthus*: nur wenig vergrößerte Fruchtkelche, Blättchen wie bei *A. campylanthus* oder *A. susianus*. Die Form der Fruchtkelche erinnert jedoch mehr an sect. *Microphysa*: Kelche in der Mitte oder im

oberen Drittel verbreitert, Röhre länger als bei den kugelig-glockigen Kelchen von sect. *Campylanthus*, Haare nicht so dick. Außerdem ähneln die Kronblätter in Form und Farbe den Arten des Verwandtschaftskreises um *A. callistachys* aus sect. *Microphysa* (TIETZ 1988). Einzigartig bei *A. magistratus* sind die langen, den Kelchzähnen ähnlichen Brakteolen (in der Originaldiagnose als Brakteen beschrieben), ein Merkmal, das die Art von allen Arten des Verwandtschaftskreises abhebt.

Der genaue Stellenwert der beiden Arten und der taxonomische Wert der Sektion muß im Rahmen einer Revision unverdornter Nachbararten überprüft werden.

Astragalus L. sect. ***Tricholobus*** Bunge, Mém. Acad. Imp. Sci. Saint Petersbourg 11(16): 69. 1868. **Lectotypus** (Podlech 1990): *A. tricholobus* DC.

Bestimmungsschlüssel:

1 Brakteolen immer vorhanden, 10–15 mm lang, fast so lang wie der Kelch, den Kelchzähnen ähnlich, fädlich; Blättchen elliptisch bis verkehrt eiförmig 1. ***A. magistratus***

– Brakteolen fehlend oder vereinzelt auftretend, kurz; Blättchen schmal elliptisch-länglich 2. ***A. tricholobus***

a Kelch 16–23 mm lang; Zähne 11–17 mm lang, immer länger als die Kronblätter; Köpfe der Blütenstände 3–4,5 cm lang und breit; Fahne (13–)15–20 mm lang, mit einer elliptischen bis breit elliptischen Platte 2a. subsp. ***tricholobus***

b Kelch 10–15(–18) mm lang; Zähne 6–10 mm lang, kürzer oder länger als die Kronblätter; Köpfe der Blütenstände 1,5–3 cm lang und breit; Fahne 11–14 (–18) mm lang, mit einer kreisrunden bis breit elliptischen Platte 2b. subsp. ***hohenackeri***

1. ***Astragalus magistratus*** Maassoumi & al., Iran. J. Bot. 4: 110. 1988. **Holotypus**: Semnan, between Semnan and Damghan, Ahevan pass, 1700 m, 15.6.1987, *Ghahreman & Mozaffarian 58936* (TARI; Iso: MSB!, THU).

Pflanzen bis ca. 10 cm, mit den Blütenständen bis 15 cm hoch, sehr dicht polsterförmig, mit sehr kurzen, sich berührenden Jahrestrieben an den Spitzen dicker, intricat verzweigter Äste. Haare rein weiß, an den Blättern 0,1–0,5(–1), am Kelch bis 3 mm lang, dünn, gerade bis gekräuselt. Äste bis 3 cm lang, mit einem Zuwachs von ca. 0,5 cm, im ersten Jahr 3–4 mm dick, von den sich deckenden Nebenblättern sehr dicht umhüllt, später mit zerrissenen Nebenblattresten und zerbrechenden Rhachiden. Nebenblätter gelbhäutig, 2–6 mm lang, aus breiter Basis dreieckig, spitz oder in eine Spitze auslaufend, mit dem Blattstiel auf 1–4 mm verwachsen, darüber durch eine Naht verbunden, auf der Gegenseite sich kaum berührend, kahl bis dicht behaart. Blätter 0,3–2 cm lang; Rhachiden deutlich verdornt, sehr dicht stehend, meist zurückgebogen, im ersten Jahr zerstreut bis dicht mit waagrecht abstehenden bis niedergedrückten, überwiegend kurzen Haaren besetzt; Blattstiel 1/3–1/2 der Rhachis; Enddorn bis 1,5 mal so lang wie die obersten Blättchen; Blättchen in 3–6 Paaren, sehr kurz gestielt, meist grau, 1–6 mm lang und 0,5–2 mm breit, kahnförmig zusammengeklappt, elliptisch bis verkehrt eiförmig, vorne gerundet bis spitz, mit einem winzigen Spitzchen, beiderseits dicht bis sehr dicht waagrecht abstehend bis halbanliegend behaart. Blütenstände die Blätter überragend, dichtkopfig, 3–4 cm lang und breit; Stiele 1,5–12 cm lang, (1–)2–6 mal so lang wie die Blätter, zerstreut bis dicht mit waagrecht abstehenden bis niedergedrückten, überwiegend kurzen und dazwischen oft auch längeren Haaren besetzt. Brakteen gelbhäutig, 6–10 mm lang, die unteren

breit eiförmig, die oberen schmal dreieckig-länglich, in eine Spitze auslaufend, sehr dicht behaart. Brakteolen immer vorhanden, 10–15 mm lang, fast so lang wie der Kelch, fädlich, den Kelchzähnen ähnlich, fedrig behaart. Blütenstiele 0,3–1 mm lang. Kelch 10–16 mm lang, zur Blütezeit röhrig, gelblichgrün bis schwach rot, zur Fruchtzeit gelb, vor allem im mittleren oder oberen Teil etwas vergrößert, ca. 4 mm breit, mit ca. 10 Nerven, dicht mit kurzen und langen geraden bis gekräuselten halbabstehenden Haaren besetzt; Zähne 5–9 mm lang, so lang wie die Röhre oder etwas länger, fädlich, aufwärts gekrümmt. Kronblätter gelblichweiß, Platten dunkelpurpurn überlaufen, beim Trocknen braungelb. Fahne 10–12 mm lang; Platte 5–6 mm lang und breit, kreisrund bis breit querelliptisch, kaum ausgerandet, oft mit kleinem Spitzchen, aufwärts gerichtet, vom rinnig-bogigen Nagel deutlich abgesetzt. Flügel 10–12 mm lang; Platten 4–5 mm lang und 1,5–2,3 mm breit, verkehrt eiförmig, kurz geöhrt; Nägel 6–8 mm lang, bogig. Schiffchen 9–11 mm lang; Platten 4–5 mm lang und 2–2,5 mm tief, dreieckig, mit bogiger Unterkante und fast gerader Oberkante, vorne spitz. Fruchtknoten dicht behaart; Griffel auf ca. 1/2 der Länge behaart. Frucht wie der Fruchtknoten fast sitzend, 5–8 mm lang, 3–4 mm hoch und 1 mm breit, von der Seite fest zusammengedrückt, elliptisch, mit einem sehr kurzen, meist gekrümmten Schnabel; Klappen kaum gewölbt, gelbbraun, hart, ziemlich dicht mit kurzen gekräuselten und längeren geraden, halbanliegenden Haaren besetzt. Samen meist einzeln, breit nierenförmig, ca. 4 mm lang und 3 mm breit, braun, glatt (immer?).
Blüte- und Fruchtzeit: VI–VII.
Vorkommen: trockene, steinige Hänge, auf Gips, Vulkangestein; 1700–2800 m.
Verbreitung: N Iran: Elbursgebirge zwischen Firuzkuh und Damghan.

Gesehene Belege:

Iran. Prov. Tehran: Namrud km 12 W Firuzkuh, 1850 m, 5.7.1972, *Amin & Bazargan 15928* (W) – 3 km W Firuzkuh, 1900 m, 6.7.1972, *Babakhanlou & Amin 16146* (W) – NW Firuzkuh, Jilizjand, 2150 m, 9.7.1972, *Babakhanlu, Amin & Bazargan 15091* (W) – 3 km W Firuzkuh, 1940 m, 9.7.1972, *Babakhanlou, Amin & Bazargan 15686* (W) – 20'SE Firuzkuh, 9500 ft, 1.7.1962, *Furse 3012* (E, W) – Firoozkooh, 2000 m, 22.6.1968, *Goodvin 9201* (W). – Prov. Semnan: Tehran - Mashhad road, 23 miles east of Semnan, 1800 m, 7.7.1972, *Alava & Iranshahr 10840* (E, TUR, W) – Oberlauf des Tscheschme-i Ali, SO des Kuh-i Nizwa neben Djaschm, 2200 m, 27.7.1948, *Behboudi & Aellen 1044* (W) – Elburz, Gadouk Cashm, 27.7.1948, *Behboudi & Aellen 5576-E* (W) – between Semnan and Damghan, Ahevan pass, 1700 m, 15.6.1987, *Ghahreman & Mozaffarian 58936* (MSB, TARI, THU) – Semnan to Daylaman, 23 miles E Semnan, 7.7.1972, *Iranshahr 15216-E* (W).

2. *Astragalus tricholobus* DC., Prodr. 2: 299. 1825 ≡ *Tragacantha tricholoba* (DC.) Kuntze, Rev. Gen.: 948. 1891. **Holotypus**: In Oriente [Kermancha ad Amadan], *Olivier* (G-DC!; Iso: LE, P!).

Abbildungen: PARSA, Flore de l'Iran 9: 96, fig.36 (als *A. kashgakius*)

Pflanzen bis 20 cm, mit den Blütenständen bis 30 cm hoch, locker bis sehr dicht verzweigt, polsterförmig bis ausgebreitet, mit kurzen Jahrestrieben an den Astspitzen. Haare rein weiß, an den Blättern und Blütenstandstielen 0,1–1,5 mm lang, basal bis subbasal angeheftet, abgeflacht, die kurzen oft schiffchenförmig, am Kelch bis 5 mm lang, dick, basal oft knotig verdickt, gerade bis gekräuselt. Äste bis 12 cm lang, mit einem Zuwachs von 0,5–2,5 cm, im ersten Jahr 2–6 mm dick, von den sich deckenden Nebenblättern dicht umhüllt, darunter behaart, später mit verholzenden Nebenblattbasen und bleibenden Rhachiden. Nebenblätter gelbhäutig, 5–9 mm lang,

aus breiter Basis schmal dreieckig, spitz, mit dem Blattstiel auf 3–6 mm verwachsen, darüber durch eine Naht verbunden, auf der Gegenseite im unteren Teil verwachsen, kahl, bisweilen bewimpert. Blätter 0,5–6 cm lang; Rhachiden deutlich verdornt, dünn und biegsam bis dick und starr, sehr dicht aufrecht stehend, die älteren auch waagrecht bis zurückgebogen, im ersten Jahr zerstreut bis dicht mit meist nur kurzen anliegenden oder anliegenden und schräg abstehenden Haaren besetzt; Blattstiel (1/5–) 1/4–1/3(–fast 1/2) der Rhachis; Enddorn an den ersten Blättern viel kürzer als die obersten Blättchen, später bis 2(–3) mal so lang wie diese; Blättchen in (3–)4–9 Paaren, dicht, meist schräg aufrecht stehend, kurz gestielt, frischgrün bis grau, 1,5–12 mm lang und 0,3–1,5 mm breit, fest zusammengeklappt oder dazwischen auch geöffnet, schmal elliptisch-länglich, bisweilen schmal eiförmig, vorne spitz, mit einer bis 0,8 mm langen Spitze, beiderseits sehr spärlich bis dicht anliegend oder anliegend bis schräg abstehend behaart, bisweilen auch kahl oder oberseits nur gegen den Rand zu behaart. Blütenstände die Blätter nur wenig bis deutlich überragend, dichtkopfig, zur Fruchtzeit 1,5–4,5 cm lang und breit; Stiele (1–)2–13 cm lang, 1–4 mal so lang wie die Blätter, zerstreut bis dicht mit kurzen oder auch längeren anliegenden oder anliegenden und schräg abstehenden Haaren besetzt. Brakteen gelbhäutig, dünn und durchscheinend bis derb, oft rot überlaufen, 4–13 mm lang, die unteren breit, die oberen schmal eiförmig bis elliptisch, zugespitzt oder in eine kleine Spitze auslaufend, kahl oder an der Spitze spärlich bewimpert. Brakteolen fehlend, selten einzelne Blüten mit zwei kleinen Brakteolen. Blütenstiele 0,5–2 mm lang. Kelch 10–22 mm lang, zur Blütezeit röhrig bis glockig, gelb oder rot überlaufen bis genervt, zur Fruchtzeit verblassend, etwas vergrößert, glockig bis kugelig, 3–4,5 mm breit, mit ca. 10–12 Nerven, zerstreut mit überwiegend langen geraden oder auch gekräuselten Haaren besetzt; Zähne 6–17 mm lang, fädlich, oft rot, 1,5–3 mal so lang wie die Röhre, kürzer oder länger als die Kronblätter. Kronblätter gelblichweiß oder Platten purpurn geadert bis überlaufen. Fahne 11–20 mm lang; Platte 8–14 mm lang und 6–12 mm breit, rund bis breit elliptisch oder elliptisch, höchstens schwach ausgerandet, gerundet bis eckig in den Nagel übergehend. Flügel 10–17 mm lang; Platten 6,5–11 mm lang und 2–4 mm breit, verkehrt eiförmig oder länglich, mit einem deutlichen, bis 1 mm langen Öhrchen; Nägel 4–8 mm lang. Schiffchen 10–16 mm lang; Platten 5,5–10,5 mm lang und 2–4 mm tief, länglich bis dreieckig, mit breit bogiger Unterkante und fast gerader bis S-förmiger Oberkante, vorne gerundet bis stumpf geschnäbelt. Fruchtknoten dicht behaart; Griffel nur an der Basis oder in der unteren Hälfte behaart. Frucht wie der Fruchtknoten fast sitzend, 5–7 mm lang, 1–2(–3) mm hoch und 2,5–4 mm breit, von oben zusammengedrückt, elliptisch bis fast rund, sehr kurz geschnäbelt; Klappen gewölbt, hart, dicht oder etwas locker mit gekräuselten und längeren geraden anliegenden bis schräg abstehenden Haaren besetzt. Samen zu 1(–2), nierenförmig bis breit nierenförmig, ca. 3–4,5 mm lang und 2,2–3 mm breit, braun oder gesprenkelt, glatt oder grubig.
Blüte- und Fruchtzeit: (IV–)V–VII(–IX).
Vorkommen: in offener, krautiger Vegetation, auf Feldern, zeitweise feuchten Wiesen, alpinen Matten, an trockenen, steinigen Hängen, in Felsspalten bis zu den Gipfelfelsen, auf Lehm, Tonschiefer, Kalk, Vulkangestein; (1000–)1400–3000 m.
Verbreitung: Gebirge NW Irans bis Azerbaidjan/Talysch.

2a. *A. tricholobus* DC. subsp. tricholobus (Synonyme siehe bei der Art)

Pflanzen dicht oder etwas locker verzweigt. Äste dünn oder dick, im ersten Jahr bis 6 mm dick. Haare an den Blättern und Stielen der Blütenstände zerstreut bis dicht; kurze Haare oft mit 0,8–1,5 mm langen Haaren vermischt. Rhachiden oft länger als 3 cm, die längeren (2,5–)3–6 cm lang. Blättchen zusammengeklappt oder teilweise ge-

öffnet, die längeren (7–)8–13 mm lang, schmal oder bis 1,5 mm breit. Blütenstände die Blätter meist deutlich überragend, zur Fruchtzeit 3–4,5 cm lang und breit. Brakteen oft dünn und durchscheinend, die längeren 8–13 mm lang. Kelch 16–23 mm lang; Zähne 11–17 mm lang, 2–3 mal so lang wie die Röhre, immer länger als die Kronblätter, meist rot. Kronblätter oft purpurn überlaufen. Fahne (13–)15–20 mm lang; Platte (8–)10–14 mm lang, breit elliptisch bis elliptisch.
Verbreitung: bisher nur Iran, meist in Lagen bis 2000 m.

Gesehene Belege:
1. Großblütige Formen

Iran. Prov. E. Azerbaijan: Mianeh, Ghaflan Kuhe, 1500 m, 29.5.1971, *Iranshahr 40973-E* (W) – 20 km Mianeh, Ghaflan Kouh, 1300–1700 m, 3.–5.6.1986, *Termeh & Daneshpajuh 41362-E* (W). – Prov. Zanjan: Zandjan - Hamadan road, Dashti on the slopes of Qeydar mt., about 35 km from Sultanieh, 2200–2600 m, 3.7.1974, *Alava 14270* (TUR) – Benab to Chaftan, 1500–1950 m, 7.6.1977, *Moussavi & Tehrani 36800-E* (W) – Zandjan to Gheydar, 35 km S Soltanieh, Kouhhoyeh Gheydar, 2200–2650 m, 3.7.1974, *Termeh & Moussavi 16461-E* (W). – Prov. Tehran: Eshtehard, Djarou mt., 24.5.1968, *Terme 40806-E* (W) – Prov. Hamadan: in Felsritzen der Berge bei Jalpan, 25.5.1882, *Pichler* (W) – Jalpan nächst Hamadan, 28.5.1882, *Pichler 221 pp* (G-BOIS) – Aq Bulaq, 35/36 N–48/27 E, ca. 100 km N Hamadan, 15.4.–1.7.1960, *Rioux & Golvan 304* (G, W). – Prov. Markazi: Arack to Qum, 15'E of Arack, 6000 ft, 22.4.1962, *Furse 1538* (E) – 4 km N Arak, 1950 m, 7.6.1959, *Pabot 1161* (G, MSB) – 4 km W (N?) Arak, 1950 m, 7.6.1959, *Pabot 12480-E* (W) – Sultanabad, in mt. Rasbend, Jun. 1896, *Strauss* (B) – In dit. urb. Sultanabad, Kuh Girdu, IX.1898, *Strauss* (B). – Prov. Bakhtaran: c. 11 km on the road from Songhor to Kangavar, 2000 m, 9.5.1987, *Maassoumi & Mirhosseini 59315* (MSB) – 14 km SW Kermanshah, 1630 m, 14.6.1959, *Pabot 1855* (G) – In mt. Kuh-i Ritschab, 20.5.1910, *Strauss* (B). – Prov. Bakhtaran/ Hamadan: In Oriente/Kermancha ad Amadan, *Olivier* (G-DC, P) – Haft-Khane, nahe Kengower Khone, 20.5.1904, *Strauss* (B). – Prov. Lorestan: Tidar, 5000 ft, 11.5.1941, *Koelz 17504* (W) – Azna, 1800 m, 12.6.1937, *Köie 1278* (B). – Prov. Esfahan?: Ispahan, 1837, *Aucher-Eloy 1266* /inter Ispahan et Teheran (G, G-BOIS, P).

2. Kleinblütige Formen

Iran. Prov. E. Azerbaijan: Mianeh, 27.5.1960, *Brown 2748* (W) – Mianeh to Zanjan, Kaflan Kuh, electricity station, ca. 1500 m, 29.5.1971, *Lamond & Iranshahr 3358* (E, M) – In mt. Kaflan Kuh pr. Mianeh, 1100–1500 m, 2.6.1971, *Lamond & Iranshahr 40838* in Hb. RECHINGER (W) – In saxosis faucium fluvii Qezel Owzan (Kizil Uzun), 13–18 km SE Mianeh, 1200 m, 6.5.1971, *Rechinger 39359* (W) – Khalkhal to Ardabil, 35 km Khalkhal, 1400–1700 m, 24.5.1974, *Terme & Moussavi 16472* (W) – Ca. 30 km NW of Tekab, 2000 m, 5.6.1974, *Wendelbo, Assadi & Shirdelpur 12209* (W). – Prov. Zanjan: 15 km from Zanjan on the road to Bijar, 1900 m, 30.5.1974, *Wendelbo, Assadi & Shirdelpur 11881* (W). – Prov. Lorestan: Shuturun-kuh foothills, Azna, 6000 ft, 6.5.1962, *Furse 1786* (E).

2b. *A. tricholobus* DC. subsp. ***hohenackeri*** (Boiss.) Tietz, **comb. nov.**
≡ *Astragalus hohenackeri* Boiss., Diagn. Pl. Orient. Nov. 2: 70. 1843 ≡ *Tragacantha hohenackeri* (Boiss.) Kuntze, Rev. Gen.: 945. 1891 ≡ *Astragalus tricholobus* DC. var. *hohenackeri* (Boiss.) Bornm., Beih. Bot. Centralbl. 32(2): 374. 1914. Syntypen: In Georgia caucasica, *Hohenacker*; Persia, *Aucher 4389*. ≡ *Astragalus tricholobus* DC. var. *minor* Hohen., Bull. Soc. Imp. Naturalistes Moscou 6: 345. 1838. Typus: In locis siccis lapidosis tr. Suwant, 5000–6000 ft, Mai, Jun., *Hohenacker*. **Lectotypus** (hoc loco designatus): In saxosis aridis mon-

tium prope Schaelledschiiran et Piresore ditionis Swant Georg. cauc., 5000 ft, May, Jun. 1836, *Hohenacker* (G-BOIS!; Iso: G!, MSB!, P!, W!).
= *A. aciphyllus* Freyn, Bull. Herb. Boissier 5: 604. 1897. Holotypus: [Persia occ., prov. Irakadjimi], prope Sultanabad, 1892, *Strauss* (BRNM!).
= *A. leptorhaphis* Bornm. & Gauba, Repert. Spec. Nov. Regni Veg. 51: 45. 1942. Holotypus: [Iran], Elburs, Hänge des Kuh-Daschteh, 1900 m, 15.6.1938, *Gauba 1469* (B!: foto MSB).
= *A. kashgakius* Parsa, Flore de l'Iran 9: 94. 1966. Holotypus: Iran Sud, Kashgak, Mai 1956, *Parsa? 20031* (K!: foto MSB).

Pflanzen meist sehr dicht bis intricat verzweigt. Äste meist dünn, im ersten Jahr 2–4 mm dick. Haare an den Blättern und Stielen der Blütenstände oft nur bis 0,5 mm lang und weniger dicht verteilt. Rhachiden meist kürzer als 3 cm, die längeren 2–2,5(–3) cm lang. Blättchen meist fest zusammengeklappt, die längeren 5–8(–10) mm lang, höchstens 1 mm breit. Blütenstände die Blätter deutlich oder auch nur wenig überragend, zur Fruchtzeit 1,5–3 cm lang und breit. Brakteen oft ledrig derb, die längeren 6–8(–10) mm lang. Kelch 10–15(–18) mm lang; Zähne 6–10 mm lang, 1,5–2 mal so lang wie die Röhre, kürzer oder länger als die Kronblätter, rot oder gelb. Kronblätter rein gelb oder zart, seltener tief purpurn; Fahne 11–14(–18) mm lang; Platte 8–10(–14) mm lang, kreisrund bis breit elliptisch.
Verbreitung: im gesamten Verbreitungsgebiet der Art, meist in Lagen über 2000 m.

Gesehene Belege:
1. Kleinblütige Formen

Azerbaidjan/Talysch. In saxosis aridis montium prope Schaelledschiiran et Piresore, ditionis Swant, VI.1905, *Fedtschenko* (L) – Lenkoran, 19.7.1931, *Grossheim* (G) – In saxosis aridis montium prope Schaelledschiiran et Piresore ditionis Swant, 5000 ft, V.–VI.1836, *Hohenacker* (G, G-BOIS, MSB, P, W) – Talysch, 1842, *Meyer* (G-BOIS).

Iran. Prov. E. Azerbaijan: near Chuli, 15 km S of Herowabad, 21.7.1970, *Ferguson 77* (W) – Ardebil, 42 km to W Nohour, Lisar, 2540 m, 23.7.1974, *Foroughi & Assadi 13803* (W) – Entre Mianeh et Kivi, Topghara, vers Yaleh-Gharshi, 1400–1600 m, 19.6.1978, *Termeh, Moussavi & Habibi 38943-E und 38945-E* (W) – Kivi, 90 km ENE Mianeh versus Khalkhal (Herowabad), 1400 m, 15.7.1971, *Rechinger 43338* (W). – Prov. Ghilan: In mont. Persiae, *Aucher-Eloy 4389* (G-BOIS, P, W: foto MSB). – Prov. Zanjan: 44 km from Gilvan, road to Zanjan, 2100 m, 18.6.1991, *Akhani 7291* (MSB) – Manjil to Zanjan, north side of Tarom Pass, 1800–2000 m, 31.5.1971, *Lamond & Iranshahr 3535* (E) – dito, Kuh Anguran, *Lamond & Iranshahr 41105* in Hb. RECHINGER (E, W) – Ca. 77 km from Mahneshan to Anguran, 2300 m, 24.5.1987, *Maassoumi 64808* (MSB) – Towards Gilvan, 50 km NE of Zanjan, Vansar, 2200–2350 m, 20.6.1983, *Moussavi, Habibi & Tehrani 41077-E* (W) – In mt. Karaghan, Kaman nächst Kaswin, 5.5.1882, *Pichler* (B, G, W) – Manjil, Rud Bar Katabeh, 1000 m, 24.4.1973, *Sabeti 15502* (W; Kümmerform!). – Prov. Tehran: W Firuzkuh, 2150 m, 9.7.1972, *Babakhanlou, Amin & Bazargan 15927* (W) – 13 km NW Firuzkuh, Jilizjand, 2150 m, 10.7.1972, *Babakhanlou, Amin & Bazargan 15120* (W) – 38 km NW Firuzkuh, Shad Mehan, 2000 m, 5.7.1972, *Bazargan & Amin 15374* (W) – Seyyedabad, road of Firuzkuh, 2500 m, 4.6.1972, *Dini & Arazm 15740* (W) – Abbarik, road of Firuzkuh, 2400 m, 12.7.1972, *Dini & Arazm 16115* (W) – Elburs, Hänge des Kuh Daschteh, 1900 m, 15.6.1938, *Gauba 1469* (B: foto MSB). – Prov. Kordestan: 40 km W of Bijar, 2200 m, 22.5.1966, *Archibald 2161* (E) – 20'N of Sanandaj, 4500 ft, 17.5.1963, *Furse 2094* (E) – Bijar, Kouh-e Hamz-e Arab, 2100–2550 m, 7.7.1968, *Iranshahr & Desfaulian 40811-E* (W) – 35/56 N – 47/01 E, Sanandaj, c. 1800 m, 18.6.1963, *Jacobs 6945* (BG, E, L, W) – In monte Hamzeh Arab SE Bijar, 2200 – 2600 m, 1.7.1971, *Lamond & Terme 42577* in Hb. RECHINGER (W) – Between Divan Darreh and Saques, 2200 m, 31.5.1974, *Wendelbo, Assadi & Shirdelpur*

11943 (G, W). – Prov. Lorestan: Inter Dorud et Azna, 3 km upstream from Qasimabad, Kamand, ca. 6030 ft, 30.5.1960, *Bent & Wright 530-103* (W). – Prov.?: Perse, *Belanger 321* (P) – Kashgak, Mai 1956, *Parsa? 20031* (K: foto MSB).

2. Großblütige Formen

Iran. Prov. Zanjan: Zanjan, towards Manjil, Tashrir, 800–2200 m, 29.5.1974, *Termeh & Moussavi 40985-E* (W). – Prov. Tehran: Road of Firuzkuh – Homand Abe Sard, 2600 m, 27.7.1973, *Bazargan & Arazm 16096* (W) – 10' NE Firuskuh, 10000 ft, 29.6.1962, *Furse 2950* (E) – M. Elburs occid., a Ab-Ali, 2300 m, 20.6.1974, *Klein* (W) – Eshtehard, Kuh-e Kardha, 23.5.1968, *Termeh 40968-E* (W). – Prov. Markazi: ad Sultanabad, 1892, *Strauss* (BRNM) – Sultanabad, ad Mowdere, 16.5.1892, *Strauss* (B) – In dit. Sultanabad, in mt. Rasbend, 15.7.1896, *Strauss* (G). – Prov. Kordestan/Lorestan: In m. Gäsawend, 1.7.1909, *Strauss* (B).

3. Übergangsformen zu subsp. *tricholobus*

Iran. Prov. E. Azerbaijan: 29 km from Mianeh towards Bostanabad, above Tunnel, 1400–1450 m, 26.6.1991, *Akhani 7885* (MSB). – Prov. Hamadan: Aq Bulaq, 35/36 N–48/27 E, ca. 100 km N Hamadan, 15.4.–1.7.1960, *Rioux & Golvan 304b* (G, W). – Prov. Kordestan: 47 km W of Bijar on road to Sanandaj, 1950 m, 2.7.1971, *Lamond 4429* (E). – Prov. Lorestan: Shuturun Kuh, VI.1890, *Strauss* (B).

Die Variabilität der Art betrifft sehr viele Merkmale, die in der Beschreibung der beiden Unterarten berücksichtigt werden.

Es handelt sich um eine in der Regel kleinblütige, kurzzähnige, kurzdornige, oft nur spärlich behaarte und eine großblütige,langzähnige, oft langdornige Sippe, die sich zusätzlich durch die Fahnenform unterscheiden lassen und wohl auch ökologisch unterschiedliche Ansprüche aufweisen (unterschiedliche Höhenlagen). Sie sind aber durch Übergänge verbunden und deshalb nur als Unterarten zu bewerten.

Die Variabilität der Art führte zu der Beschreibung der in die Synonymie von *A. hohenackeri* verwiesenen Arten.

Die Analyse der Typusbelege zeigt folgende Unterschiede:

A. hohenackeri	kleinblütig,	Kelchzähne kürzer als die Kronblätter
A. kashgakius	"	Kelchzähne etwa so lang wie die Kronblätter
A. leptorhaphis	"	Kelchzähne länger als die Kronblätter
A. aciphyllus	großblütig,	Kelchzähne kürzer als die Kronblätter

Bei allen Belegen sind die Kelchzähne zum Unterschied von subsp. *tricholobus* aber höchstens 10 mm lang.

Der in sect. *Microphysa* beschriebene *A. aciphyllus* wurde von BORNMÜLLER (1906) als *A. tricholobus* erkannt und später zusammen mit den großblütigen Straussschen Pflanzen von Gäsawend und Mowdere als var. *hohenackeri* betrachtet. Da BORNMÜLLER laut eigenen Angaben den Typus von *A. hohenackeri* nicht kannte (1942), betrachtete er *A. hohenackeri* als großblütig und trennte davon *A. leptorhaphis* ab.

Die großblütigen Exemplare von subsp. *hohenackeri* sind in der Tat sehr auffallend, aber anscheinend weniger häufig als die kleinblütigen (Klammerwerte in der Beschreibung). Deshalb werden sie in der vorliegenden Arbeit getrennt aufgelistet.

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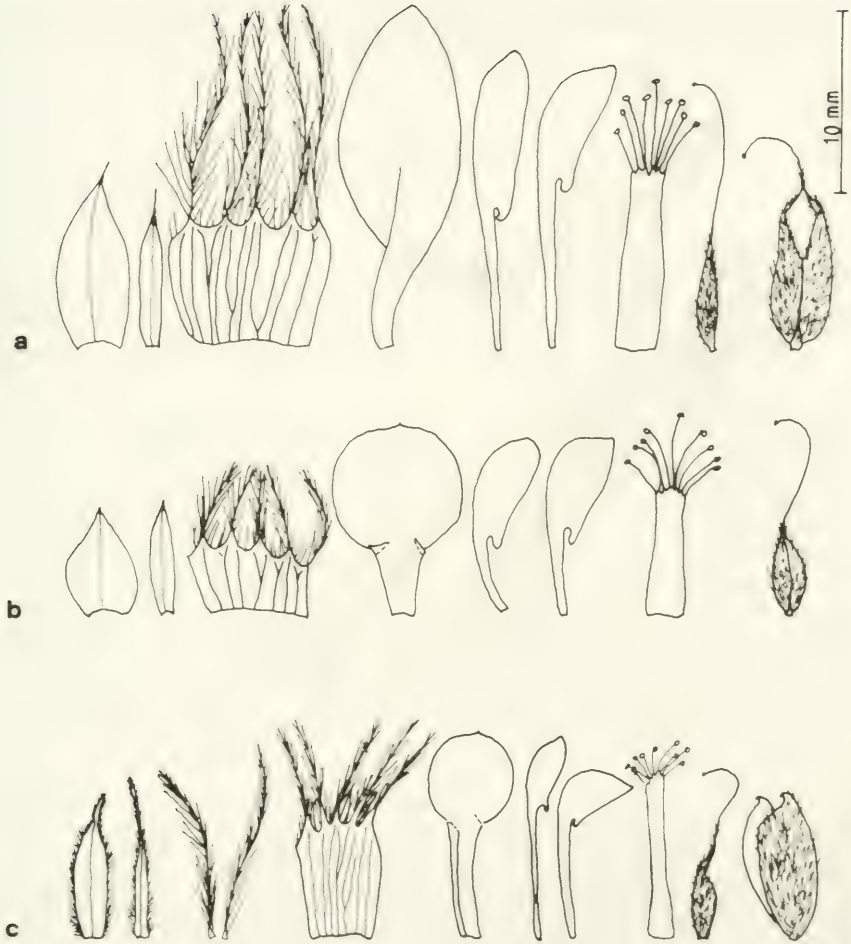
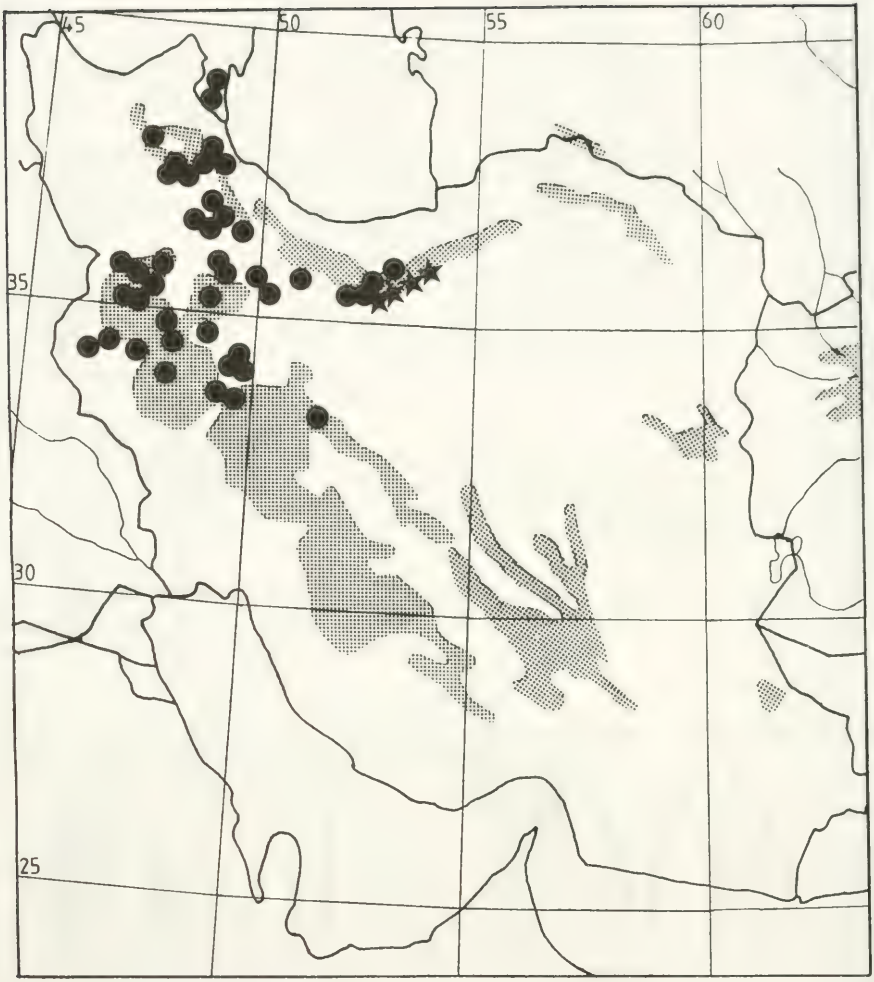


Blütenanalyse (von rechts nach links: Brakteen im unteren und oberen Teil des Blütenstandes, Brakteolen: nur bei c, Kelch, Fahne, Flügel, Schiffchen, Staubfadenrinne, Fruchtknoten, Frucht).
a: *A. tricholobus* subsp. *tricholobus*: *Pichler*, 25.5.1882 (W); Frucht: *Terme & Moussavi 16461-E* (W). – b: *A. tricholobus* subsp. *hohenackeri*: *Foroughi & Assadi 13803* (W); Brakteen: *Archibald 2161* (E). – c: *A. magistratus*: *Goodvin 9201* (W); Frucht: *Behboudi & Aellen 5576-E* (W).



Verbreitung von: ● *A. tricholobus*
★ *A. magistratus*

Seeds and seedlings in Hanguanaceae and Flagellariaceae (Monocotyledons)

H.-J. TILLICH

Abstract:
TILLICH, H.-J.: Seeds and seedlings in Hanguanaceae and Flagellariaceae (Monocotyledons). – Sendtnera 3: 187–197. 1996. – ISSN 0944–0178.

The fruit in *Hanguana* is a 1-seeded berry. The seed coat is a sclerified meso-endotesta, the inner integument disappears. The endosperm is differentiated into a peripheral 1-layered aleuron region and an inner tissue of starch containing cells. The fruit in *Flagellaria* is a drupe with a massive endocarp composed of lignified stone cells. The seed coat is represented by the thick but not lignified outer periclinal cell walls of the epidermis cells of the outer integument and is firmly fixed to the fruit wall. The copious endosperm contains great amounts of compound starch grains.
The seedlings of both genera share ancestral character conditions with respect to the compact cotyledon and a leaf sequence starting with cataphylls. Using the system of DAHLGREN et al. (1985) as a base, Hanguanaceae represents a basal offshoot of Commelinales and has no relations to Asparagales. The position of Flagellariaceae as a basal group in Poales is confirmed.

Zusammenfassung:
Die Früchte von *Hanguana* sind einsamige Beeren. Die Samenschale ist als Meso-Endotesta entwickelt, das innere Integument geht zugrunde. Das Endosperm ist in eine periphere Aleuron-Schicht und ein zentrales, stärkereiches Gewebe differenziert. Die Gattung *Flagellaria* besitzt Steinfrüchte mit einem massiven, aus verholzten Steinzellen aufgebauten Endocarp. Die Samenschale besteht nur aus der dicken, aber nicht verholzten Außenwand der Epidermiszellen des äußeren Integuments und ist mit der Fruchtwand verwachsen. Das Endosperm ist reich an Stärke.
Die Keimpflanzen beider Gattungen besitzen als ursprüngliche Merkmale einen kompakten Cotyledo und eine mit Niederblättern beginnende Blattfolge. Die Hanguanaceae gehören nicht in die Asparagales sensu DAHLGREN et al. (1985), sondern passen am besten als basale Seitengruppe in die Commelinales. Die Stellung der Flagellariaceae als basale Gruppe in den Poales wird bestätigt.

Introduction

After splitting the classical family Flagellariaceae Dumortier (1829), mainly on anatomical and palynological reasons, the question arose as for the nearest relatives of

the three monogeneric families Flagellariaceae s.str., Hanguanaceae Airy Shaw (1965) and Joinvilleaceae Tomlinson & Smith (1970). While the position of Flagellariaceae s.str. and Joinvilleaceae in Poales is generally undisputed (cf. DAHLGREN et al. 1985, CHASE et al. 1995, KELLOGG & LINDER 1995, STEVENSON & LOCONTE 1995), the position of *Hanguana* was assumend in the last decade in Asparagales (DAHLGREN et al. 1985) or in the "Commelinoids" (RUDALL & CADDICK 1994, CHASE et al. 1995).

As to the structure of seeds and seedlings, the three families are known very incompletely. The only figure of an *Flagellaria* seedling is given in ARBER (1925). This very small and uncommented drawing gives no answer as to morphological details. The fruit structure of *Flagellaria* is disputed: it is reported to be a 1-seeded berry (BROWN 1902, HEPPER 1968) or a drupe (NAPPER 1971, LARSEN 1972, SMITH 1979, VILLIERS 1984, HARDEN 1993). HARRIMAN (1991) leaves the question open and describes the fruit to be "globose,..., 1–3-seeded". The *Hanguana* seedling is unknown, the seed is said to be starchless. This was an argument of DAHLGREN et al. (1985) to include *Hanguana* in the Asparagales. The fruit again is described as a drupe (LARSEN 1972) or a berry (DAHLGREN et al. 1985). HUBER et al. (1995) even propose to include again *Hanguana* into Flagellariaceae since the seed structure of *Hanguana* is maintained to indicate a relationship to *Flagellaria*.

It was demonstrated recently, that seedling structure may be an important additional source of characters for monocot systematics (TILLICH 1995). This paper aims to present data on fruit, seed and seedling structure in *Flagellaria* and *Hanguana* and to check the applicability of the results to the problems in question.

Materials and methods

Flagellaria indica L. fruits were harvested in October 1992 from a specimen cultivated at Botanischer Garten München. It then took 18 months from sowing until germination commenced.

Hanguana fruits of an probably undescribed species were collected by J. Bogner in Sarawak (Malaysia), near Semenggoh, at March 10, 1994. They were sown at March 15, 1994, the first signs of germination were observed five weeks later. One of the seedling plants is now successfully cultivated at the Botanischer Garten München.

Alcohol material of two seedlings probably of the same species as above, received as *Hanguana malayana* (Jack.) Merr., collected by R. Brett (no. 1) at Bukit Timah Nature Reserves, Singapore, on 24.8.1993, was generously provided by P. Rudall, Royal Botanic Gardens, Kew.

Seedlings were cultivated in Petri dishes (20 × 5 cm) on moist filter paper as described earlier (TILLICH 1992, 1994). The morphological analysis was made using a Wild Stereomicroscope MZ 8 with drawing equipment. To study the anatomy of seeds handcuttings were stained with standard staining procedures. Microscopical drawings were made with a Leitz Laborlux S and drawing equipment.

Alcohol material of all investigated seeds and seedlings is stored at the seedling bank at the Institut für Systematische Botanik, München.

Results

1. *Hanguana*:

The infructescence of *Hanguana* is a spike of whitish fleshy fruits, each with a small subtending bract and the remnants of the perigon at its base (fig. 1 A). The fruit is a one-seeded berry. The seed has a basal position and archs over a globose placenta, so that the seed shape is similar to a bowl turned upside down (figs. 1 B–E). The bowl margin is modified by a small lingular extension. The hilum position is inside the "bowl" at its bottom, the micropyle position is opposite to it at the outside surface. The distance between lower and upper surface of the seed (i.e. the thickness of the bowl wall) is about 0.5 mm, the total seed diameter is 5–6 mm.

The seed coat, using CORNERS (1976) terminology, is of the meso-endotestal type. The inner integument disappears. The outer epidermis cells are filled with dark brown substances, their outer periclinal wall is mostly more or less collapsed. In the testal "mesophyll" region the tissue is totally sclerified. As can be concluded from the few visible cell lumina, the original cells might have been of fibrous shape. A strong sclerification is also found in the cell walls of the inner epidermis, but the cells seem to have been somewhat suppressed by the growing endosperm before sclerification commenced (fig. 1 G).

A remarkable character of the endosperm is its differentiation in a peripheral aleuron layer and a central starch tissue. This is in contrast to DAHLGREN et al. (1985), who maintained that the seed is free of starch. The starch grains are simple and subglobose with concentric layers.

At the beginning of the germination process the primary root pushes a small circular operculum aside and grows in length. The cotyledonary sheath, which produces only traces of chlorophyll if at all, remains extremely short and low, its position is in direct contact to the seed. The cotyledonary hyperphyll has only haustorial function. This cotyledon type was termed a compact cotyledon (TILLICH 1995) and is considered the most ancestral type in Monocotyledons. No hypocotyl, collar or collar rhizoids are discernable. The primary root is brownish in colour and covered with relatively long root hairs (fig. 2 A). Plumule development begins with some pale green cataphylls in spiral arrangement, and in the course of further shoot development the following leaves gradually change to primary foliage leaves (eophylls) with closed sheaths. The internodes of the primary axis exept the epicotyl are somewhat elongated, the degree of elongation depending on the growth conditions (cf. fig. 3).

The two first shoot-born roots (in TILLICH 1995 erroneously the term "shoot-borne" was used. The term "shoot-born" is the correct translation for the german term "sproßbürtig") have about the same diameter as the primary root and break through the bases of the first and second cataphylls in the transverse plane of the seedling, both producing a small coleorhiza (fig. 2 E). The third shoot-born root, developing some weeks later, is clearly thicker than the first roots (fig. 2 F). Primary and shoot-born roots are freely branched. A branched primary root is again a typical ancestral condition in monocots.

2. *Flagellaria*:

The *Flagellaria* fruit is a drupe with a relatively thin fleshy mesocarp and a subglobose lignified endocarp. The stone cells have only a small empty lumen, the thick lignified cell wall is passed by numerous pits (fig. 4 A). From the periphery to the center of the fruit wall the cell diameters decrease remarkably. The innermost endocarp cells are totally compressed by the growing seed, they form just a homogeneous, lignified layer of cell wall material.

In the ripe fruit the seed coat is crushed and firmly fused with the fruit wall. The only discernable structure of the testa are the thick, colourless outer cell walls of the outer epidermis of the outer integument (fig. 4 A). In the uniform endosperm cells starch is stored in great amount. The starch grains are relatively small but of different size, their outline being angular rather than rounded (fig. 4 B). These grains are members of compound super-grains which desintegrate in microscopical cuttings. This is in contrast to HAMANN (1961), who has mentioned for *Flagellaria* simple starch grains.

The hard, lignified endocarp is a serious barrier for the embryo. Only one of the two stone kernels harvested in the greenhouse germinated after one year and a half. As to the seedling structure only early developmental stages of this one seedling could be observed, since the plant was soon infected by fungi. The root pole breaks through the top of endocarp opposite the basal remnants of the flower axis. The seedling possesses a compact, pale cotyledon very similar to *Hanguana*. Differing from that genus the collar is well developed and consists of large cells which produce but a few collar rhizoids. The first plumular leaf is a folded, green cataphyll (fig. 4 C).

Discussion

Fruits, seeds and seedlings of *Hanguana* and *Flagellaria* are distinguished by a number of characters. This is in agreement with anatomical and palynological evidence and supports the separation of *Hanguana* from Flagellariaceae and even from Poales. All available evidence about *Hanguana* points out, that the nearest living relatives of *Hanguana* are probably the Commelinaceae. The Botanischer Garten München, by the courtesy of P. Rudall recently received two young plants of *Hanguana* from Singapore, collected by R. Brett. These plants are not to distinguish from the seedling plant grown in our laboratory from seeds collected by J. Bogner in Sarawak. These three plants are very dissimilar to *H. malayanum* (Jack.) Merr. and certainly represent an undescribed species. They amazingly resemble in habit certain Commelinaceae with broad and petioled leaves, as, for instance, *Palisota*.

Berries are missing in Poales (the unusual fruit of the bambusoid genus *Melocanna* needs morphological reconsideration), but are met with in some Commelinaceae, e.g. *Palisota*. Furthermore, a sclerified testal seed coat is missing in Poales. In Restionaceae and Centrolepidaceae the seed coat is tegmic and formed by the inner layer of the inner integument (KIRCHER 1986). The seeds of Flagellaria (and probably Joinvillea) and Poaceae, firmly enclosed in drupes or caryopses, possess a strongly reduced seed coat. In Commelinales, on the other hand, manifold forms of seed coat occur (cf. GIULIETTI et al. 1987, DANILOVA et al. 1995). In the few Commelinaceae members thoroughly investigated, both integuments contribute to the seed coat, but the principal protecting layer is formed by the inner layers of the outer integument (MAHESHWARI & BALDEV 1958, GROOTJEN 1983, GROOTJEN & BOUMAN 1981). The testal seed coat is found again in *Hanguana* (see fig. 1 G).

The *Hanguana* seedling represents a very ancient type. This is obvious by the combination of a compact, achlorophyllous cotyledon, a robust, freely branching primary root, an indiscernible root collar and a foliation sequence starting with a number of cataphylls. Primitive character states of seedling organs are also scattered in Commelinales, though combined with more derived organ structures. Some Commelinaceae have a compact cotyledon, but the collar is of special construction, and the leaf sequence starts with eophylls (*Cyanotis*, *Weldenia*). In *Cartonema* the collar is inconspicuous and the primary root is well developed, but the cotyledon is of the far derived *Bromus* type and the seedling develops a short mesocotyl. *Hanguana* in this context is best placed as a basal offshoot of the Commelinales.

STEVENSON & LOCONTE found *Hanguana* to be a sister group of Zingiberales, mainly due to some shared apomorphies, as for instance petioled leaves, silica bodies or inaperturate pollen grains. It is true that these characters are predominant in Zingiberales, but they are by no means absent from Commelinales. Petioled leaves and silica bodies are met with in some Commelinaceae, inaperturate pollen is reported in *Abolboda* (ERDTMAN 1971). Additionally, the missing perisperm, the differentiation of the endosperm in aleuron and starch containing tissues, and also the hypogynous flower of *Hanguana* strongly argue against a Zingiberalean relationship. The affiliation of *Hanguana* to Zingiberales as resulting from a cladistic analysis seems to be due to a simplification of the character matrix in order to make it readable for the computer.

The affiliation of *Hanguana* to Asparagales, as proposed by DAHLGREN et al. (1985) is now refuted, since it was shown that the cell walls contain phenolic compounds (HARRIS & HARTLEY 1980, RUDALL & CADDICK 1994) and the endosperm contains starch.

The seedling of *Flagellaria* is in part of ancient structure with respect to the compact, achlorophyllous cotyledon and the leaf sequence beginning with cataphylls. But, in contrast to *Hanguana*, the root collar is conspicuously developed and produces some collar rhizoides, and the primary root has an only trifling growth. A seedling with such a character combination could serve well as a basic model for the derivation of the Poacean seedling. This would include the following processes:

1. Development of a coleoptile
2. Total reduction of the primary root
3. Transformation of the collar to a coleorhiza of the first shoot-born root

It is noteworthy in this connection, that regarding to SACK (1994) the stomata complex of *Flagellaria* also represents a preliminary stage to those of Poaceae in that the guard cells are much less specialized than in Poaceae.

The seedlings of Centrolepidaceae and Restionaceae investigated so far are similar to each other but have a very different construction type compared to *Flagellaria* or Poaceae (KIRCHER 1986, TILLICH 1995). They resemble Juncaceae or Typhaceae seedlings rather than Poaceae.

Acknowledgements

I am indebted to Dr. Paula Rudall, Royal Botanic Gardens, Kew, and Joseph Bogner, Botanischer Garten München. They provided generously fruits, seeds, seedlings or young plants of *Hanguana* and *Flagellaria*, respectively. Without their unselfish help and permanent interest this work would have been impossible.

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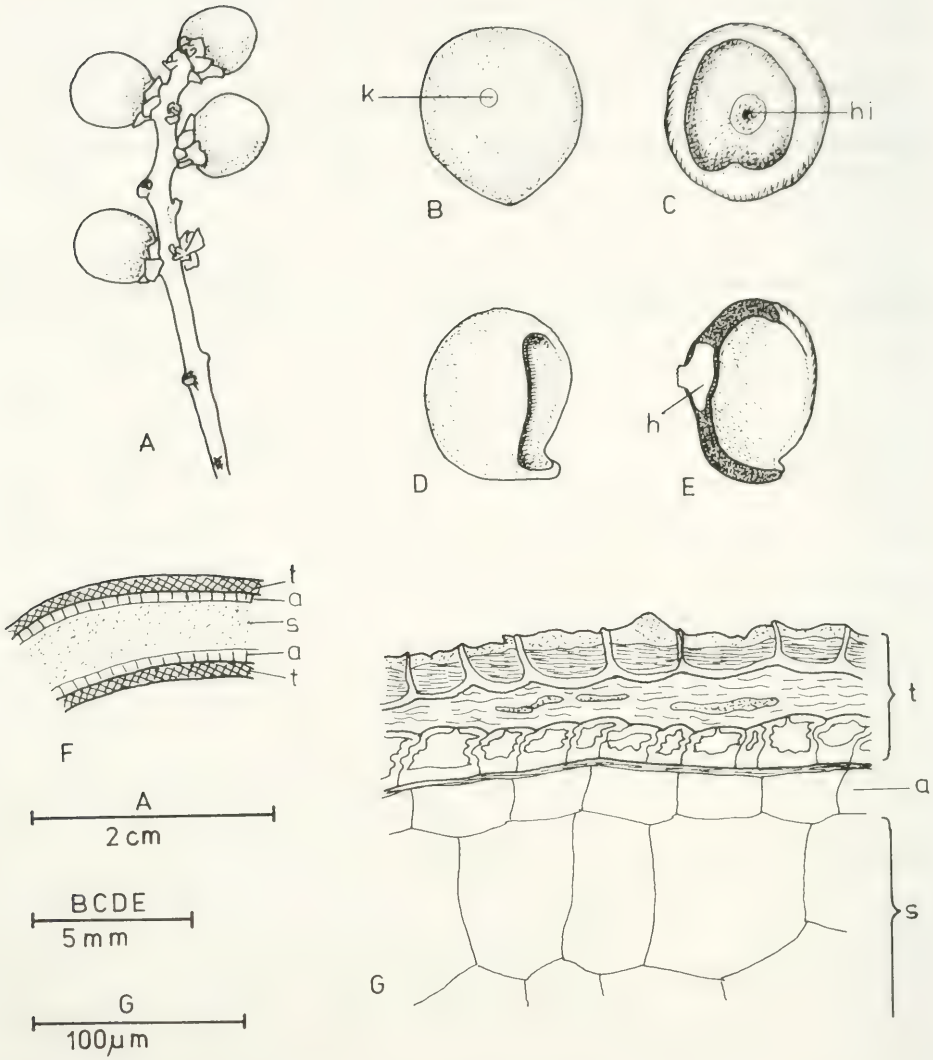

Fig. 1. *Hanguana* spec. A: infructescence (collected by J. Bogner in Sarawak). B–G: seed (collected by R. Brett in Bukit Timah Nature Reserves, Singapore). B–E: seed shape, the seed is shown after detachment of the seedling plant. B: seed from above, showing the germination pore. C: seed from below, showing the hilum position. D: seed in lateral view, note the small lingular extension of the seed margin at bottom right. E: seed in median section, note the low thickness of the seed and the position of the haustorium. F: schematical cross section of the seed. G: cross section of the seed coat and adjacent endosperm. a: aleuron layer. h: haustorium. hi: hilum. k: germination pore. s: starch containing endosperm. t: testa.

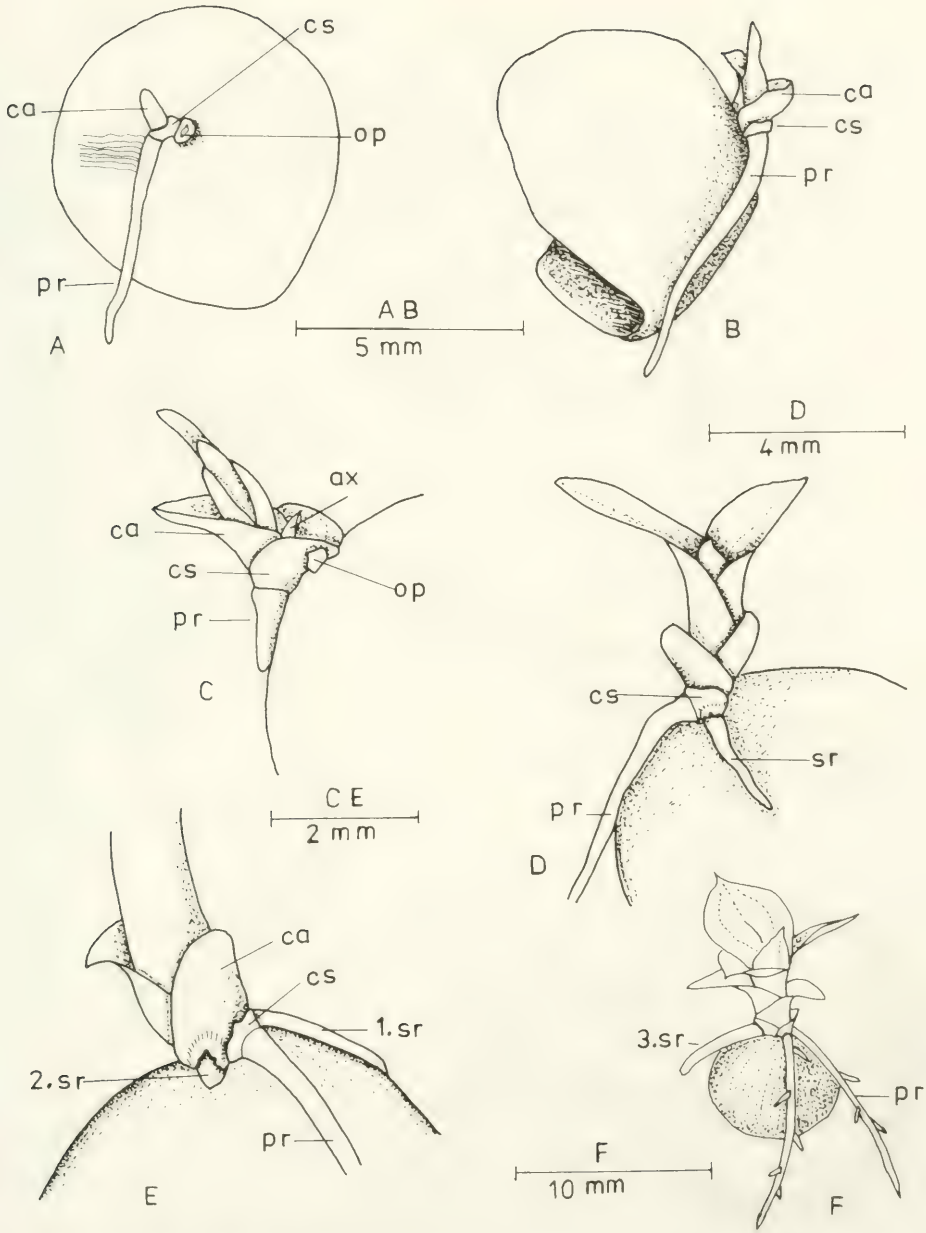

Fig. 2. *Hanguana* spec. Seedlings grown from seeds collected by J. Bogner in Sarawak. A, B, D–F: the same plant in successive stages of development. A, B: early stages of development, note that the cotyledonary sheath is very small in relation to seed size. C: young seedling showing a bud in the cotyledon axil. D: the first shoot-born root has emerged. E: the second shoot born-root emerges breaking through a small coleorhiza. F: branching of older roots, including the primary root begins. ax: prophyll of the bud in the cotyledon axil. ca: first cataphyll. cs: cotyledonary sheath. op: operculum. pr: primary root. sr: shoot-born root.

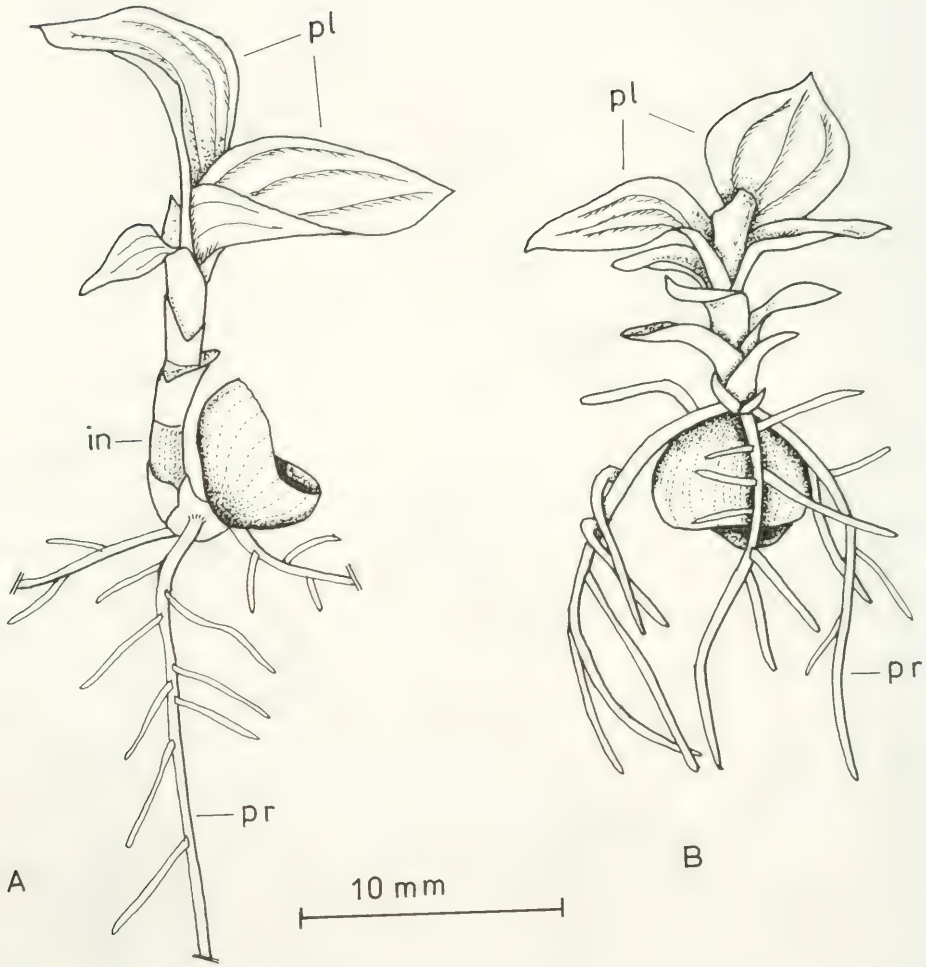

Fig. 3: *Hanguana* spec. A: seedling grown in soil under natural conditions, collected by R. Brett in Bukit Timah Nature Reserves, Singapore. Details of cotyledon and shoot base structure are not recognizable in this late stage of development. B: seedling grown in permanent light condition and from storage material of the seed only, seed collected by J. Bogner in Sarawak. in: elongated internode. pl: primary foliage leaves (eophylls). pr: primary root.

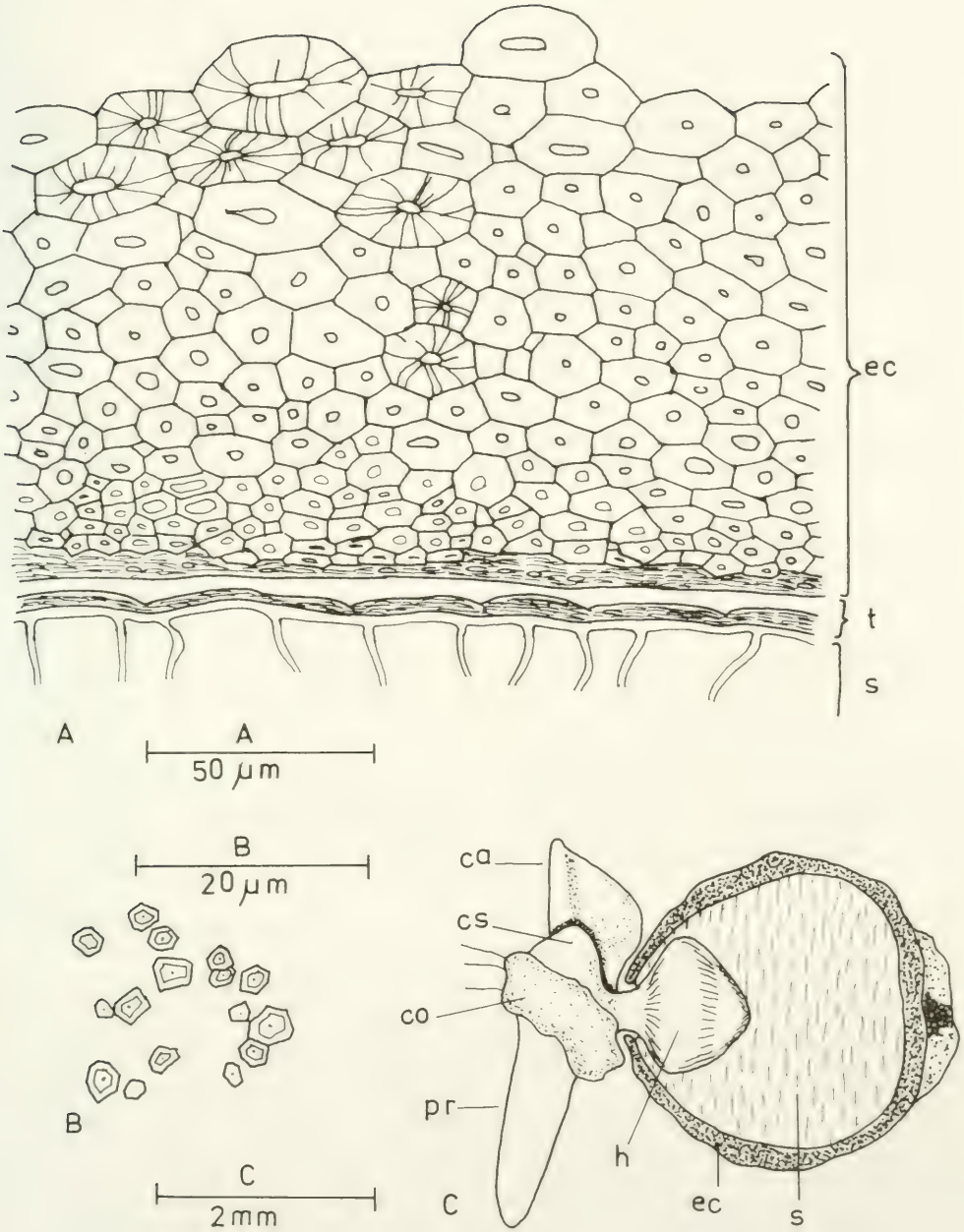

Fig. 4. *Flagellaria indica*. A: cross section of the endocarp and adjacent seed coat and endosperm. The pit canals are indicated only in a few stone cells. B: starch grains from endosperm. C: young seedling, the endocarp and endosperm shown in median longisection.

Notes on the ascus types in Crocicreas (Leotiales, Ascomycetes) with a characterization of selected taxa

D. TRIEBEL & H.O. BARAL

Abstract:
TRIEBEL, D. & BARAL, H.O.: Notes on the ascus types in Crocicreas (Leotiales, Ascomycetes) with a characterization of selected taxa. – Sendtnera 3: 199–218. 1996. – ISSN 0944–0178.

Ten taxa of *Crocicreas* with a mainly European distribution, including the type species of *Crocicreas* and its suggested generic synonyms: *Belonioscypha, Conchatium* and *Cyathicula* are characterized using light microscopy. Three different amyloid ring structures of the asci occurring in this genus are described: the *Calycina*-type, the closely related *Conchatium*-type and the *Hymenoscyphus*-type. The non-amyloid ascus apical structure of a fourth group of taxa are regarded as having been derived from ascus tips with a ring of the *Hymenoscyphus*-type. With regard to the ascus types and some other more or less correlating characters two separate lineages within *Crocicreas* are recognized. The occurrence, shape and taxonomic value of strongly refractive vacuolar bodies in living paraphyses and cortical excipular hyphae is discussed. Notes on the generic delimitation of *Crocicreas* and *Allophylaria* are given. The new combination *Crocicreas fraxinophilum* (Svrcek) Triebel & Baral is proposed.

Zusammenfassung:
Zehn, vor allem in Europa verbreitete Sippen aus der Gattung *Crocicreas*, inklusive der Typusarten von *Crocicreas* und der hierin einzuschließenden, teils umstrittenen Genera *Belonioscypha, Conchatium* und *Cyathicula* werden lichtmikroskopisch charakterisiert. Drei verschiedene Typen amyloider Ringstrukturen in den Asci werden beschrieben: der *Calycina*-Typ, der eng verwandte *Conchatium*-Typ und der *Hymenoscyphus*-Typ. Die nicht amyloide Ascusapicalstruktur einer vierten Artengruppe wird als abgeleitet von einer Apicalstruktur mit Ring vom *Hymenoscyphus*-Typ interpretiert. Aufgrund der Ascusmerkmale und einiger damit mehr oder weniger korrelierender Merkmale lassen sich zwei Entwicklungslinien innerhalb *Crocicreas* unterscheiden. Das Auftreten, die Gestalt und die systematische Bedeutung stark lichtbrechender Vakuolarkörper in den lebenden Paraphysen und Rindenhyphen des Excipulums wird beschrieben und diskutiert. Probleme der Gattungsumgrenzung von *Crocicreas* und *Allophylaria* werden erörtert. Die Neukombination *Crocicreas fraxinophilum* (Svrcek) Triebel & Baral wird vorgeschlagen.

Introduction

The order Leotiales comprises mostly non-lichenized ascomycetes with apothecia characterized by an ascohymenial ontogeny and unitunicate, inoperculate asci which have an eversion type dehiscence. Although the size of the amyloid structure of the ascus apex is relatively small, e.g. five to ten times as narrow as those in the Lecanorales, leotialean asci are not difficult to study using simple light microscopical methods. Nevertheless, characters derived from the leotialean ascus apex have been generally neglected, not only in older but also in most modern systematic treatments.

Recent results gained from light microscopical and electron microscopical methods (BARAL 1987 a, TRIEBEL 1992, VERKLEY 1992, 1993 a, 1993 b, 1995) indicate that the asci in Leotiales provide a complex of taxonomically significant characters. Those observed using light microscopical methods include the shape of the ascus apex, relative thickness of its individual wall layers, the shape of the amyloid ring (annulus), its staining reactions in varying concentrations of Lugol's iodine solution and the type of dehiscence.

It is strongly recommended that fresh material is examined for a more complete and reliable characterization of leotialean taxa (BARAL 1992, HUHTINEN 1994). The presence and shape of strongly refractive vacuolar bodies, in particular, only visible in living cells of the paraphyses and of the cortical excipular hyphae, proved to be taxonomically relevant in certain groups, e. g., to distinguish between species of *Allophylaria* (P.Karst.) P.Karst. and *Crocicreas (Cyathicula)* (see discussion further below and BARAL 1992: 363 ff.).

The genus *Crocicreas* Fr. was described by FRIES (1849) for a single species, *Perisporium gramineum* Fr., which occurs on culms of grasses. The generic name was not accepted by most of the later authors. In 1864, DE NOTARIS described the genus *Cyathicula* De Not. to which he assigned eleven species. *Cyathicula coronata* (Bull.: Fr.) De Not., mostly growing on dead herbaceous stems, was chosen as the lectotype by CLEMENTS & SHEAR (1931) (see also CARPENTER & DUMONT 1978). *Cyathicula* was used by most of the earlier authors for leotialean taxa with stalked, gelatinous apothecia. REHM (1892), for instance, distinguished it by the dentate apothecial margin and the 0–1-septate ascospores from *Belonioscypha* Rehm (with 3-septate, mainly halonate ascospores) and *Phialea* (Fr.) Gillet (with edentate apothecial margin and 0–1-septate ascospores). VELENOVSKY (1934), DENNIS (1956) and SVRCEK (1979) generally maintained this generic concept. SVRCEK (1979) used the name *Conchatium* Velen. for most of the species placed in *Phialea* by DENNIS (1956).

CARPENTER (1981) provided a monographic treatment of this group of fungi. He regarded *Cyathicula* as well as *Belonioscypha* Rehm and with some hesitation also *Conchatium* Velen. (= *Phialea* sensu Rehm) as later synonyms of *Crocicreas*, as the hyphal tissues of their ascomata are very similar (CARPENTER 1981: 3, 4, 23). In the generic concept of CARPENTER (1981), *Crocicreas* comprises fungi of the family Leotiaceae with sessile to stalked, white, pale yellow, greyish or brown apothecia. The taxa have an ectal exciple consisting of long-celled, subparallel, occasionally branching and anastomosing hyphae immersed in a gelatinous matrix. The hyphoid cortical layer is often covered with large numbers of rhomboid crystals. Most species are found on dead herbaceous stems and culms, some on dead petioles, inflorescences or twigs of flowering plants.

Meanwhile the name *Phialea* (Pers.: Fr.) Gillet was rejected as illegitimate under ICBN Art. 56.1. and is not to be used (GREUTER et al.: 1994, Appendix IV).

CARPENTER's generic concept was followed by most authors. There are only a few doubts about the synonymization of *Crocicreas* and *Cyathicula* (see BARAL 1994, BARAL & KRIEGLSTEINER 1985, ERIKSSON & HAWKSWORTH 1987, 1993,

TRIEBEL & BARAL 1993). BARAL (in BARAL & KRIEGLSTEINER l.c.) restricted the name *Crocicreas* to *C. gramineum* (Fr.) Fr. var. *gramineum* and *C. gramineum* var. *incertellum* (Rehm) S.E.Carp., both taxa with lanceolate paraphyses. He treated fourteen species with cylindrical paraphyses under the name *Cyathicula*. The consistent absence of rhomboid crystals in *Crocicreas* was mentioned as a further distinguishing character between the two genera. Using light microscopical methods, TRIEBEL & BARAL (1993) studied the ascus apices of the type species of *Crocicreas* and *Cyathicula* emphasizing the differences in the amyloid ring structure. VERKLEY (1993 b) examined *Crocicreas cyathoideum* (Bull.: Fr.) S.E.Carp. var. *cyathoideum* and *Crocicreas pallidum* (Velen.) S.E.Carp., both species with cylindrical paraphyses, and found ultrastructural differences in features of their ascus apical apparatus. VERKLEY (1995: 186, 193) placed *C. pallidum* and *C. coronatum* in the "Hymenoscyphaceae" and *C. cyathoideum* close to the Sclerotiniaceae.

In the following, selected taxa of *Crocicreas* are characterized using light microscopical methods. These results, especially concerning the different ascus structures and some features which can only be observed in fresh material are presented as a contribution to a better understanding of the natural relationships within this group of fungi.

Material and methods

Herbarium material from K, LU, M, REG, UPS, and from some private herbaria (hb. CLERC, hb. SCHEUER and hb. BARAL) was studied. The majority of the species was also studied from fresh (living!) material which after examination was deposited in M or in hb. BARAL. Sections were made by hand or freezing microtome and mounted in tap water or various staining reagents i.e., iodine-potassium iodide solution (1%) [= Lugol's solution (MERCK 9261); I_{Lugol}], iodine-potassium iodide solution (3%) [$I_{Lugol\ conc}$], Melzer's reagent (original formula, without KOH-pretreatment) [I_{Melzer}] and aqueous Brilliant cresyl blue solution (1%). The specimens were examined by means of standard light microscopical techniques. Measurements of fresh material were made in tap water, those of dead herbarium material in water or in KOH (5–10%). The lipid content of living ascospores was studied in water, of dead spores in KOH. Further information on methods of measurements used here and the characterization of living material are given in BARAL (1992). The terms "euamyloid" and "hemiamyloid" are used in the sense of BARAL (1987 b).

Specimens examined:

Crocicreas calathicola: **France**. Dept. Savoie: Val-Thorens, 2500 m, on dead capitula of *Cirsium spinosissimum*, 26 August 1989, *Collin* (hb. BARAL 4047) – Haute Savoie, massif du Mt. Blanc, La Pierre à Beranger, 2440 m, on dead capitula of *Cirsium spinosissimum*, 1 August 1993, *Clerc* (hb. CLERC). – **Switzerland**. Kt. Tessin: Gotthardpass, surroundings of the mountain refuge "Cantoniera", near the shore of the river Reuss, on dead capitula of *Cirsium spinosissimum*, July 1882, *Winter* (RABENHORST & WINTER, Fungi europaei 2747 sub *Helotium calathicolum*; M). – **Austria**. Tirol: Ötztaler Alpen, Pitztal, surroundings of the mountain hut "Neue Chemnitzer Hütte" E of Plangeroß, on decaying capitula of *Cirsium spinosissimum*, 26 July 1961, *Poelt* (M) – Pitztal, Mittelberg, near the glacier "Taschach-Gletscher", c. 1920 m, on decaying capitula of *Cirsium spinosissimum*, August 1875, *Rehm* (REHM, Ascomyceten 305; M – isolectotype of *Helotium calathicola* Rehm). – Salzburg: Hohe Tauern, Durchgangswald, 1800 m, on old capitula of *Carlina acaulis*, 20 September 1990, *Rücker & Lohmeyer* (hb. BARAL 4243).

Crocicreas coronatum: **Germany**. Brandenburg: Triglitz in der Prignitz, on decaying stems of *Solidago canadensis*, 10 October 1915, *Jaap* (JAAP, Fungi selecti exs. 762 sub *Cyathicula coronata*; M). – Baden-Württemberg: Tübingen-Pfrondorf, Tiefenbach, 410 m, on dead stems of cf. *Sanicula europaea*, 5 October 1985, *Baral* (hb. BARAL 2942) – Tübingen-Pfrondorf, Sophienpflege, 460 m, on dead stems of *Senecio erucifolius*, 30 August 1986, *Baral* (hb. BARAL 3067, M). – Sachsen: Surroundings of Königstein, on decaying stems of *Aster leucanthemus*, 4 October 1911, *Krieger* (KRIEGER, Fungi saxonici 2171 sub *Cyathicula coronata*; M).

Crocicreas culmicola: **Germany**. Baden-Württemberg: Tübingen-Pfrondorf, Sophienpflege, 460 m, on dead culms of Poaceae, 13 June 1985, *Baral* (hb. BARAL 2929) – Tübingen, Schweigbrühl, 340 m, on dead culms of cf. *Poa* spec., 29 July 1988, *Marson & Baral* (hb. BARAL 3492). – Sachsen: Surroundings of Pulsnitz, on dry culms of *Molinia coerulea*, October 1881, *Staritz* (RABENHORST & WINTER, Fungi europaei 3165 sub *Belonidium vexatum*; M). – **U.S.A.** New York: Newfield, on old culms of *Andropogon*, November 1881, collector not indicated (ELLIS, North American Fungi 850 sub *Peziza vexata*; M).

Crocicreas cyathoideum var. ***cyathoideum***: **Germany**. Baden-Württemberg: Stuttgart-Feuerbach, Lemberg, close to Horn, 360 m, on dead stems of *Urtica dioica*, 10 May 1975, *Baral* (hb. BARAL 1063) – Tübingen-Pfrondorf, road Blaihofstraße, 430 m, on dead stems of cf. *Pimpinella major*, 31 May 1988, *Baral* (hb. BARAL 3426a) – Tübingen-Pfrondorf, Eichenfirst, 500 m, on dead stems of *Sambucus ebulus*, 8 July 1989, *Baral* (hb. BARAL 3791a). – Sachsen-Anhalt: Surroundings of Eisleben, "Wiesen", on decaying stems of *Epilobium hirsutum*, May 1879, *Kunze* (KUNZE, Fungi selecti exs. 294 sub *Peziza cacaliae* b. *epilobii*; M). – Bayern: Oberbayern, Landkreis Eichstätt, valley Affental c. 1.5 km NE of Buchenhüll, c. 430 m, on dead stems of *Urtica dioica*, 14 June 1990, *Triebel & Rambold* (TRIEBEL, Microfungi exs. 4 sub *Cyathicula cyathoidea*; M) – region "Bayrischer Wald", mountain Arber, on dead culms of grasses, September 1885, *Rehm* (REHM, Ascomyceten 863; M, growing intermixed with *Crocicreas megalosporum* var. *gramineum*). – **Austria**. Kärnten: Surroundings of Steindorf, near the lake "Ossiachersee", on stems of *Solanum tuberosum*, June, *v. Keissler* (Kryptogamae exs. 1170 sub *Phialea cyathoidea*; M).

Crocicreas cyathoideum var. ***cacaliae***: **Germany**. Schleswig-Holstein: Helgoland, Mittelland, Kringel, c. 10 m, on dead inflorescences of *Dipsacus silvestris*, 27 June 1986, *Lohmeyer* (hb. BARAL 4852, K). – **Switzerland**. Kt. Wallis: Verbier, on *Ononis repens*, 29 May 1955, *Müller* (M). – Kt. Graubünden: Davos, Davos-Dorf, Matten/Dischmatal, c. 1590 m, on dead culms and inflorescences of *Phleum* spec., 4 September 1990, *Baral & Weber* (hb. BARAL 4184). – **Austria**. Tirol: Surroundings of Sulden am Ortler, moraine of the glacier "Sulden Gletscher", on dead stems of *Trifolium pallescens*, c. 2700 m, July 1884, *Rehm* (REHM, Ascomyceten 810; M – isolectotype of *Helotium glanduliforme* var. *robustior* Rehm). – Niederösterreich: Surroundings of Rosenau, mountain Sonntagberg, on dry stems of *Ononis spinosa*, July, *Strasser* (Kryptogamae exs. 1321 sub *Phialea glanduliformis*; M).

Crocicreas dolosellum: **Germany**. Niedersachsen: Ostfriesland, Norden, the village Berum, c. 0 m, on dead culms of cf. *Phalaris* spec., 17 November 1994, *Stabenau* (hb. BARAL 5188). – Bayern: Nature reserve "Nationalpark Bayrischer Wald", Spiegelau, Guglöd, Klosterforst, 785 m, on dead culms of grasses, 20 October 1989, *Luschka* (REG).

Crocicreas fraxinophilum: **Germany**. Baden-Württemberg: Tübingen-Pfrondorf, Tiefenbach, 400 m, on petioles of *Fraxinus excelsior*, 21 October 1985, *Baral* (hb. BARAL 2947) – Same locality, 410 m, on dead petioles of *Fraxinus excelsior*, 24 October 1987, *Baral* (hb. BARAL 3293a). – Bayern: Oberbayern, Mittlere Isarau, T-crossing of the promenade on the E bank and the walking trail to the small village "Fischerhäuser", c. 3 km NNE of Ismaning, c. 475 m, on dead petioles of *Fraxinus excelsior*, 12 November 1995, *Triebel & Rambold* (will be distributed in TRIEBEL, Microfungi exs.; M, hb. BARAL).

Crocicreas gramineum var. ***gramineum***: **Sweden**. Lycksele Lappmark: Tärna par., southern slope of the mountain Ussmeten, about 1 km NW of the outlet of Lake Abelvattnet, on *Poa nemoralis*, 25 August 1968, *Lohammar* (UPS) – Sorsele s:n, "Bosse Grundströms hus" (RUBIN 25 G 8a 1612), on *Poa alpigena*, 29 July 1982, *Gustafsson* (UPS). – **Germany**.

Sachsen: Surroundings of Königstein, on dead leaves of grasses, May 1902, *Krieger* (KRIEGER, Fungi saxonici 1835 sub *Phialea stipae*; M). – **Austria**. Tirol: Surroundings of Sulden am Ortler, near the farm houses "Gampenhöfe", c. 2000 m, on dead leaves and stems of grasses, June 1884, *Rehm* (Rehm, Ascomyceten 767; M – isolectotype of *Helotium stigmaion* var. *minusculum* Rehm).

Crocicreas gramineum var. ***incertellum***: **Germany**. Thüringen: Surroundings of Erfurt, Steiger, on dead leaves of *Koeleria pyramidata*, June–July 1906, *Diedicke* (SYDOW, Mycotheca germanica 505 sub *Phialea incertella*; M).

Crocicreas megalosporum var. ***megalosporum***: **Austria**. Steiermark: Schladminger Tauern, Kleinsölk-Obertal, Schwarzensee, 1163 m, on leaves of *Carex rostrata*, 5 August 1984, *Scheuer* (hb. SCHEUER 675).

Crocicreas megalosporum var. ***gramineum***: **Germany**. Bayern: Region "Bayrischer Wald", mountain Arber, on dead culms of grasses, September 1885, *Rehm* (REHM, Ascomyceten 863; M – isolectotype of *Helotium dolosellum* (P.Karst.) Rehm f. *gramineum* Rehm; growing intermixed with *Crocicreas cyathoideum* var. *cyathoideum*).

Crocicreas starbaeckii: **France**. Dept. Vosge: Gérardmer, near Les Vasenes, Le Cerceneux Marion, c. 950 m, on dead stems of *Ranunculus aconitifolius*, 4 June 1988, *Deny* (hb. BARAL 3434). – **Germany**. Brandenburg: Potsdam, bog Fresdorfer Moor, on dead stems of *Equisetum fluviatile*, 30 June 1970, *Benkert* (K). – Hessen: Prov. Hessen-Nassau, Rhöngebirge, surroundings of Gersfeld, mountain Eube, on decaying stems of *Ranunculus* spec., 6 July 1907, *Sydow* (SYDOW, Mycotheca germanica 599 – isolectotype of *Phialea turbinata* Sydow; M). – **Switzerland**. Kt. Luzern: Luzern. Stans, S of Wirzweli, Engelberger Au, close to Horn, c. 1200 m, on dead stems of *Ranunculus mollis*, 9 June 1985, *Baral & Breitenach* (hb. BARAL 2922a). – **U.S.A**. New York: Essex Co., North Elba Township, Trailhead, Northville-Placid Trail, Averyville, along Chubb River, on dead stems of *Ranunculus* spec., 8 June 1991, *Haines 4658, Raitviir & Spooner* (K).

Results

The ascus types and some other diagnostically relevant features in *Crocicreas*

Living asci of *Crocicreas* have very thin apical thickenings (see fig. 6a, 7a, 8a, 10a,b and 12a), which expand as a result of the "imbibition effect" in the dead state (see BARAL 1992: 351).

Valuable taxonomic characters can be derived from dead asci after treatment with Lugol's solution. The ascus apices of four groups of species are described below. One group has non-amyloid ascus apices. The others have ascus apices with amyloid ring structures of three different types: the *Calycina*-type, the *Conchatium*-type and the *Hymenoscyphus*-type.

1. The ascus apex of *Crocicreas* s. str. with ring of the *Calycina*-type (*Crocicreas gramineum* var. *gramineum*, *C. gramineum* var. *incertellum*; figs. 1–3)

The ascus apex is subconical. The apical thickening (for definition see BELLEMÈRE 1994: 116; VERKLEY 1992: 5; fig. 13 in this paper) is rather reduced. The amyloid annulus (= ring), especially its apical part which spreads in lateral direction, is rather thick in comparison to the thickness of the central cylinder (for definitions see BELLEMÈRE 1994: 116; VERKLEY 1992: 5; fig. 13 in this paper). The basal end of the ring strongly protrudes into the ascoplasm (annular protrusion, "pendatif"; for definition see BELLEMÈRE 1994: 116; VERKLEY 1992: 5; fig. 13 in this paper). The iodine reaction is strong in all parts; using Lugol's solution (without KOH-pretreatment) the amyloid ring shows a strongly blue reaction. Only at the basal end is a tendency to a dirty grey-red reaction observable. At higher concentrations the whole

ring stains distinctly reddish. In Melzer's reagent the ring turns blue (without KOH-pretreatment). After complete eversion during discharge, the ring retracts to c. 45°. No collarette-like structure is seen in dehisced asci ("foramen immarginé" sensu BOUDIER 1885: 92).

The obconical (somewhat T-like) shape of the ring resembles that of the species of *Mollisia* (Fr.) P.Karst., *Incrucipulum* Baral and *Calycina* Nees ex Gray figured by BARAL (1987 a: figs. 24–26). This type of amyloid ring was included within the *Bulgaria*-type by BARAL (l.c.) but is here separated as *Calycina*-type, because it is distinctly thinner than the ring in *Bulgaria* Fr. Furthermore the asci with an amyloid ring of the *Calycina*-type have distinctly thinner ascus walls than those in *Bulgaria*. The *Calycina*-type is close to the *Laetinaevia*-type (BARAL l.c.: figs. 18–22) but the apical part of the ring does not so strongly spread in lateral direction. The *Calycina*-type of amyloid ring also resembles the *Conchatium*-type (see below). The iodine reaction is classified as hemiamyloid, type RB (fide BARAL 1987 b). VERKLEY's "type VIII (preliminary): '*Chlorociboria-Pezizella-Calycina*'" (VERKLEY 1995: 186) based on the ultrastructure of the ascus apical apparatus mainly coincides with the *Calycina*-type circumscribed here but also includes the ring type of *Crocicreas cyathoideum* (here referred to as *Conchatium*-type).

2. The ascus apex of the *Crocicreas cyathoideum*-group with ring of the *Conchatium*-type (*C. cyathoideum* var. *cyathoideum*, *C. cyathoideum* var. *cacaliae*, *C. dolosellum*, *C. fraxinophilum*, *C. starbaeckii*; figs. 4–7)

The ascus apex is rounded to conical but never papillate. The apical thickening is more or less reduced; the amyloid ring is rather thick compared with the thickness of the central cylinder. The apical part of the ring is parallel or slightly spreads in lateral direction, its basal end shows a more or less distinct annular protrusion; the iodine reaction is strongly blue in all parts of the ring, or fades somewhat in its upper half; it is bluish at concentrations up to 3% iodine (BB, euamyloid). After discharge the everted ring retracts at least to c. 45°, thereby resembling undischarged asci of the *Calycina*-type. No collarette-like structure is observable ("foramen immarginé").

For this type of amyloid ring the term *Conchatium*-type is introduced here. It is intermediate between the *Calycina*- and *Hymenoscyphus*-type and sometimes not easily distinguishable from the former (see above, and fig. 3, 6).

3. The ascus apex of the *Crocicreas coronatum*-group with ring of the *Hymenoscyphus*-type (*C. calathicola, C. coronatum, C. culmicola*; figs. 8–12)

The ascus apex is conical and more or less papillate. The apical thickening is abundant. The amyloid ring is quite thin in all parts compared to the thickness of the central cylinder. The apical part of the ring is parallel or scarcely spreads laterally, and its basal end scarcely protrudes into the ascoplasm. The iodine reaction is weak to strong in the basal part, and fades or disappears abruptly towards the apex; it is bluish at concentrations up to 3% iodine (BB, euamyloid). After discharge, the everted ring retracts to c. 45°, the apical thickening is still present. In most cases a distinct collarette-like structure is observed ("foramen marginé" sensu BOUDIER 1885: 92).

The parallel-cylindrical shape of the apically fading ring closely resembles that of *Hymenoscyphus* Gray (after exclusion of misplaced taxa). It was already referred to as *Hymenoscyphus*-type by BARAL (1987 a: 126, figs. 10–12). The electron micrographs of *Crocicreas pallidum* (VERKLEY 1993 b: fig. 16, 17, 66) are quite similar at the ultrastructural level and were categorized by VERKLEY (1995: 187) as "Type XIII: *Hymenoscyphus*".

4. The ascus apex of the *Crocicreas megalosporum*-group without an amyloid ring (*C. megalosporum* var. *megalosporum*, *C. megalosporum* var. *gramineum*)

This type of ascus apex is not treated in detail here because it completely lacks an iodine reaction in Lugol's solution or Melzer's reagent (with or without KOH-pretreatment). The apical thickening is abundant, and a weak "foramen marginé" is present in discharged asci. The shape of the ascus apex, the development of a "foramen marginé" and the large guttulate ascospores resemble those of the *C. coronatum*-group.

The amyloid ring structures recognizable under light microscopy are important taxonomic characters. These structures "largely correspond with the structurally differentiated part observed in TEM, which usually reacts strongly in the PA-TCH-SP procedure" (VERKLEY 1995: 162). However, PA-TCH-SP-reactive structures do not always react with iodine (VERKLEY l.c.).

Some other diagnostically relevant features in *Crocicreas* are given in tab.1. One of these concerns the presence or absence of croziers. This character proved to be useful on species or variety level except in *Crocicreas cyathoideum* var. *cyathoideum* and *C. cyathoideum* var. *cacaliae*. There it is constant within the same population but varies within the same taxon.

In all species of *Crocicreas* studied from fresh collections, the living paraphyses and some cortical hyphae of the ectal exciple contain many small, roundish, strongly refractive, hyaline vacuolar bodies (see BARAL 1992: 365, fig. 27 for *C. fraxinophilum*) which take up basic dyes like cresyl blue. These bodies become reddish-brown by oxidation if pressed or otherwise damaged. This is one of the reasons for the darker colour of the (dead) apothecia in herbarium material, even if rehydrated, than in fresh material. These guttules completely disappear in herbarium specimens. Since up to now there have been no fresh collections of *Crocicreas gramineum* var. *gramineum* or *C. gramineum* var. *incertellum* available to us, and no information on the vacuolar bodies to be found in the literature, we know nothing about their presence in the *Crocicreas gramineum*-group (see also discussion further below).

A characterization of selected taxa

In the following, ten taxa of *Crocicreas* with a mainly European distribution, including the type species of *Crocicreas* and its suggested generic synonyms: *Belonioscypha*, *Conchatium* and *Cyathicula* are characterized. Regarding the features discussed above, we feel unable to accept *Cyathicula* as a separate genus as proposed by BARAL (in BARAL & KRIEGLSTEINER 1985). Therefore the concept of CARPENTER (1981), who used the older name *Crocicreas* in a wide sense, is accepted here.

1. *Crocicreas calathicola* (Rehm) S.E.Carp.

Characters derived from herbarium specimens. Apothecial morphology: Apothecia pale brown, stipitate; margin non dentate or with small teeth up to 50 µm long. Apothecial anatomy: Rhomboid crystals on the outer surface of the apothecium absent or few present. Paraphyses 1.5–3 µm wide, cylindrical, exceeding the asci by 0–6 µm. Asci 45–68 µm long, 5–6 µm wide, not-stalked or short-stalked, with croziers. Ascus apex (fig. 8–9) hemispherical to subconical; apical thickening well developed, 0.5–2 µm tall; amyloid ring of *Hymenoscyphus*-type, 0.8–1.2 µm wide, 0.9–2 µm tall (immature state), 0.8–1.2 µm wide, 0.5–0.8 µm tall (mature state), at the top not or rarely very slightly spreading, I_{Lugol} + pale blue to blue (euamyloid), rarely negative,

I $_{Melzer}$ + pale blue or negative, slightly protruding into the ascoplasm; with a more or less distinct "foramen marginé" after spore discharge. Ascospores 0-septate, 6–10.5 µm long, 2.5–3.5 µm wide; lipid content very low.

Additional characters derived from fresh material. Apothecial morphology: Apothecia pale yellowish. Apothecial anatomy: Paraphyses (3–)4–5 µm wide. Asci 70–92 µm long, 6.5–7.4 µm wide. Ascospores 7–11 µm long, 3–4 µm wide. Vacuolar bodies (in cells of paraphyses and cortical hyphae of ectal exciple) abundant, small, roundish, strongly refractive.

Notes. The shape of the ascus apex is hemispherical to subconical (fig. 8–9) and shows some similarities to that of *Crocicreas fraxinophilum* (fig. 7), a species with amyloid ring of the *Conchatium*-type.

2. *Crocicreas coronatum* (Bull.: Fr.) S.E.Carp., the type species of *Cyathicula* DeNot.

Characters derived from herbarium specimens. Apothecial morphology: Apothecia reddish-ochraceous to pale brown, short- to long-stipitate; margin distinctly dentate; teeth acute, 200–500 µm long. Apothecial anatomy: Rhomboid crystals on the outer surface of the apothecium present or rarely absent. Paraphyses 2–2.5 µm wide, cylindrical, exceeding the asci by c. 5–10 µm or not. Asci 75–105 µm long, 6–10 µm wide, with a long tapering stalk, with croziers. Ascus apex (fig. 10–11) papillate to conical; apical thickening well-developed, 2.4–3.3 µm tall (immature state), 1–1.5 µm tall (mature state); amyloid ring of *Hymenoscyphus*-type, 0.7–1.5 µm wide, 1–3 µm tall, not spreading at the top, I $_{Lugol}$ + blue (euamyloid), I $_{Melzer}$ + blue, at the base scarcely protruding into the ascoplasm; with "foramen marginé" after spore discharge. Ascospores 0(–1)-septate, 12–19 µm long, 3–4(–5.5) µm wide; lipid content very high.

Additional characters derived from fresh material. Apothecial morphology: Apothecia cream-white. Apothecial anatomy: Paraphyses 3–3.5 µm wide, 7–10 µm shorter than mature asci. Asci 100–140 µm long, 9–11.8 µm wide. Ascus apex apical thickening 0.6–1.2 µm tall. Ascospores (13–)15–22(–24) µm long, (3–)3.5–5(5.3) µm wide. Vacuolar bodies (in cells of paraphyses and cortical hyphae of ectal exciple) abundant, small, roundish, strongly refractive.

Notes. This species is treated in detail by BELLEMÈRE (1958, 1967: 872–876). His figures (BELLEMÈRE 1958: fig. 3, 1967: fig. 139) show the refractive granulation in cells of the paraphyses and cortical hyphae, and the typical shape of the amyloid ring structure in the ascus apex.

3. *Crocicreas culmicola* (Desm.) S.E.Carp., the type species of *Belonioscypha* Rehm

Characters derived from herbarium specimens. Apothecial morphology: Apothecia pale brown to dark brown, substipitate to long-stipitate; margin non dentate or with distinct broad triangular teeth c. 80–120 µm long. Apothecial anatomy: Rhomboid crystals on the outer surface of the apothecium present or rarely absent. Paraphyses 2–4.5 µm wide, cylindrical, apically obtuse, sometimes apically moniliform, exceeding the asci by c. 5–20 µm or not. Asci 110–153 µm long, 10.5–15 µm wide, not-stalked or more or less shortly attenuated towards the base, with croziers. Ascus apex (fig. 12) papillate to conico-papillate; apical thickening well developed, 2–3 µm tall (immature state), 1–1.5 µm tall (mature state); amyloid ring of *Hymenoscyphus*-type, 1.4–3.5 µm wide, 1–3 µm tall (immature state), slightly spreading at the top, I $_{Lugol}$ + strongly blue (euamyloid), I $_{Melzer}$ + blue, at the base slightly protruding into the ascoplasm; with

"foramen marginé" after spore discharge. Ascospores 3-septate, distinctly halonate, 18–25 µm long, 3.5–6 µm wide; lipid content low.

Additional characters derived from fresh material. Apothecial morphology: Apothecia white to rose. Apothecial anatomy: Paraphyses 3.5–5 µm wide, 15–20 µm shorter than mature asci. Asci (128–)135–193(–234) µm long, 13–15(–16.5) µm wide. Ascus apex apical thickening c. 0.7–1 µm tall. Ascospores (23–)25–31(–35) µm long, (3.5–)3.8–4.5(–4.7) µm wide. Vacuolar bodies (in cells of paraphyses and cortical hyphae of ectal exciple) abundant, small, roundish, strongly refractive.

4. *Crocicreas cyathoideum* (Bull.: Fr.) S.E.Carp. var. *cyathoideum*

Characters derived from herbarium specimens. Apothecial morphology: Apothecia pale brown, stipitate; margin non dentate or with teeth 20–30 µm long. Apothecial anatomy: Rhomboid crystals on the outer surface of the apothecium present or rarely absent. Paraphyses 1.5–3.6 µm wide, cylindrical, exceeding the asci by c. 5–7 µm or not. Asci 35–62 µm long, 4.4–6 µm wide, short-stalked, with croziers or sometimes with simple septa. Ascus apex (fig. 5) slightly conical; apical thickening scarcely developed, 0.8–1.1(–1.5) µm tall; amyloid ring of *Conchatium*-type, 0.7–0.8(–1.2) µm wide, 0.7–0.9 µm tall (immature state), 0.6–0.8 µm tall (mature state), I_{Lugol} + strongly blue (euamyloid), I_{Melzer} + blue, somewhat protruding into the ascoplasm when immature, strongly protruding when mature; with "foramen immarginé" after spore discharge. Ascospores 0-septate, 7–12.3 µm long, 1.5–2.5 µm wide; lipid content low.

Additional characters derived from fresh material. Apothecial morphology: Apothecia white to ochraceous. Apothecial anatomy: Paraphyses 2.5–3.8 µm wide, 3–5 µm shorter than mature asci. Asci 52–65(–75) µm long, 4.5–6.3 µm wide. Ascospores (6–)7–11(–13) µm long, 1.7–2.3(–2.5)µm wide. Vacuolar bodies (in cells of paraphyses and cortical hyphae of ectal exciple) abundant, small, roundish, strongly refractive.

5. *Crocicreas cyathoideum* var. *cacaliae* (Pers.: Fr.) S.E.Carp., the type species of *Conchatium* Velen.

Characters derived from herbarium specimens. Apothecial morphology: Apothecia pale brown to dark brown, short-stipitate to stipitate; margin non dentate or subdentate. Apothecial anatomy: Rhomboid crystals on the outer surface of the apothecium absent or abundant. Paraphyses 1.5–2 µm wide, cylindrical, exceeding the asci by c. 5–10 µm or not. Asci 42–53 µm long, 5–6 µm wide, not-stalked, with croziers or with simple septa. Ascus apex slightly conical; apical thickening scarcely developed, 1.5–2 µm tall; amyloid ring of *Conchatium*-type, 1–1.5 µm wide, 1.2–2 µm tall, slightly spreading at the top, I_{Lugol} + blue (euamyloid), I_{Melzer} + blue, scarcely protruding into the ascoplasm; with "foramen immarginé" after spore discharge. Ascospores 0-septate, (7.5–)10–14 µm long, 2–2.5(–3) µm wide; lipid content low.

Additional characters derived from fresh material. Apothecial morphology: Apothecia cream-olivaceous. Apothecial anatomy: Asci 55–60 µm long, 5.8 µm wide. Ascospores 8–13.4 µm long, 1.8–2.8 µm wide. Vacuolar bodies (in cells of paraphyses and cortical hyphae of ectal exciple) abundant, small, roundish, strongly refractive.

Notes. This taxon is closely related to *C. cyathoideum* var. *cyathoideum* and is treated here in accordance with CARPENTER (1981) at varietal rank.

6. *Crocicreas dolosellum* (P.Karst.) S.E.Carp.

Characters derived from herbarium specimens. Apothecial morphology: Apothecia greyish-ochraceous to red-brown, stipitate; margin with narrow, acute teeth 50–100 µm long. Apothecial anatomy: Rhomboid crystals on the outer surface of the marginal teeth abundant. Paraphyses 2.5–3.3 µm wide, apically cylindrical or slightly attenuated, with rounded apices, exceeding the asci by c. 0–8 µm. Asci 52–59 µm long, 5–5.5(–6) µm wide, slightly attenuated towards the base, with simple septa. Ascus apex (fig. 6) slightly conical; apical thickening slightly developed, 0.7–1.2 µm tall; amyloid ring of *Conchatium*-type, 0.8–0.9 (–1) µm wide, 0.7–1.2 µm tall (immature and mature state), scarcely or rarely distinctly spreading at the top, I_{Lugol} + blue (euamyloid), I_{Melzer} + blue, somewhat protruding into the ascoplasm, apically scarcely fading; with an indistinct "foramen marginé" after spore discharge. Ascospores 1-septate, 13–16 (–17.5) µm long, 2.3–2.6 µm wide; lipid content relatively low.

Additional characters derived from fresh material. Apothecial morphology: Apothecia whitish-cream. Apothecial anatomy: Paraphyses 3.3–4.2 µm wide. Asci 62–73(–78) µm long, 6.3–6.7(–7) µm wide. Ascospores (11–)13–18(–19.5) µm long, 2.3–2.7(–2.9) µm wide. Vacuolar bodies (in apical cells of paraphyses and in cortical hyphae of ectal exciple) abundant, small, roundish, strongly refractive.

Notes. This species is characterized by the ascospores which are already 1-septate in mature living asci. *Crocicreas culmicola* differs in the 3-septate halonate ascospores and by the ascus apex with an amyloid ring of *Hymenoscyphus*-type. The specimen figured by BREITENBACH & KRÄNZLIN (1981: fig. 193) as *Cyathicula dolosella* was re-examined by one of the authors (H.O.Baral) and found to represent *Crocicreas pallidum* or a taxon closely related to it.

7. *Crocicreas fraxinophilum* (Svrcek) Triebel & Baral comb. nov.
Basionym: *Conchatium fraxinophilum* Svrcek, Ceská Mykol. 40: 205 (1986).

Characters derived from herbarium specimens. Apothecial morphology: Apothecia ochraceous, long-stipitate; margin with broad teeth 50–80 µm long. Apothecial anatomy: Rhomboid crystals on the outer surface of the apothecium present or rarely absent. Paraphyses 2–2.7 µm wide, apically cylindrical to slightly lanceolate, with broadly rounded apices, exceeding the asci by c. 2–9 µm. Asci 60–76 µm long, 5.3–5.7 µm wide, with a long attenuated base, with croziers. Ascus apex (fig. 7) slightly to distinctly conical; apical thickening weakly developed, 1.6 µm tall (immature state), 1 µm tall (mature state); amyloid ring of *Conchatium*-type, 0.7 µm wide, 1–1.6 µm tall, not spreading at the top, I_{Lugol} + strongly blue (euamyloid), I_{Melzer} + blue, protruding into the ascoplasm; with a more or less distinct "foramen immarginé" after spore discharge. Ascospores 0-septate, 11.5–14.5 µm long, 2–2.2 µm wide; lipid content low.

Additional characters derived from fresh material. Apothecial morphology: Apothecia whitish. Apothecial anatomy: Paraphyses 2.7–3.7 µm wide, c. 4 µm shorter than mature asci. Asci (75–)80–90(–100) µm long, 7–8(–8.5) µm wide. Ascus apex apical thickening 0.3–0.4 µm tall. Ascospores (13–)14–18(–20) µm long, (2.2–)2.5–2.8(–3) µm wide. Vacuolar bodies (in cells of paraphyses and cortical hyphae of ectal exciple) abundant, small, roundish, strongly refractive.

Notes. For further information on this species see BARAL (1993: 5).

8. *Crocicreas gramineum* (Fr.) Fr. var. *gramineum*, the type species of *Crocicreas*

Characters derived from herbarium specimens. Apothecial morphology: Apothecia dark brown, substipitate; margin non dentate or with very small teeth. Apothecial anatomy: Rhomboid crystals on the outer surface of the apothecium absent. Paraphyses 1.5–5 µm wide, some lanceolate, exceeding the asci by c. 8–22 µm, some cylindrical. Asci 35–54 µm long, 5–8.5 µm wide, not-stalked, with croziers. Ascus apex (fig. 1–2) subconical; apical thickening weakly developed, 1–1.5 µm tall; amyloid ring of *Calycina*-type, 1.2–1.6 µm wide, 1–1.5 µm tall, spreading at the top, I_{Lugol} + dirty brown to blue, basally dirty brown to red-brown, $I_{Lugol\ conc}$ + red-brown (hemiamyloid, type RB), I_{Melzer} + blue, strongly protruding into the ascoplasm; with "foramen immarginé" after spore discharge. Ascospores 0-septate, 8–12.5 µm long, 2–3 µm wide; lipid content relatively high.

Notes. Fresh material has not been available. The iodine reaction is classified as hemiamyloid. The red (hemiamyloid) reaction may change to blue (euamyloid) in older herbarium material as was demonstrated for a number of specimens of *Pezicula* Tul. & C.Tul. more than c. 40 years old (BARAL 1992: 374). However, in one specimen of *Crocicreas gramineum* collected in 1884 (REHM, Ascomyceten 767, M), the reaction was still somewhat reddish but only at a high iodine concentration.

Crocicreas gramineum has two types of paraphyses: lanceolate paraphyses which exceed the asci and cylindrical ones (CARPENTER 1981). In KOH some variation in the occurrence of lanceolate paraphyses and the ascospore measurements is observable: One specimen (*Gustafsson*; UPS) has many lanceolate paraphyses of very variable thickness (c. 2–5 µm) which overtop the asci by c. 8–22 µm. The spores measure 8–9.2 × 2–2.2 µm. Another specimen (REHM, Ascomyceten 767; M) has only a few lanceolate paraphyses (1.8–2.2 µm wide) which scarcely exceed the asci and spores of 11–12.5 × 2.5–3 µm. A third specimen (KRIEGER, Fungi saxonici 1835; M) has also only a few lanceolate paraphyses (1.5–3.2 µm wide) which exceed the asci by c. 10–13 µm and spores of 8.5–10 × 2–2.5 µm.

9. *Crocicreas gramineum* var. *incertellum* (Rehm) S.E.Carp.

Characters derived from herbarium specimens. Apothecial morphology: Apothecia dark brown, substipitate; margin non dentate or with very small teeth. Apothecial anatomy: Rhomboid crystals on the outer surface of the apothecium absent. Paraphyses 1–4 µm wide, some cylindrical, some lanceolate, the latter exceeding the asci by c. 9–20 µm. Asci 24–35 µm long, 4.5–5.5 µm wide, not-stalked, with croziers. Ascus apex (fig. 3) subconical; apical thickening weakly developed, 1 µm tall; amyloid ring of *Calycina*-type, 0.8–1.2 µm wide, 0.8–1.2 µm tall, slightly spreading at the top, I_{Lugol} + and $I_{Lugol\ conc}$ + blue, scarcely turning dirty brown (euamyloid), I_{Melzer} + blue, strongly protruding into the ascoplasm; with "foramen immarginé" after spore discharge. Ascospores 0-septate, 6–7.5 µm long, 1.5–2 µm wide; lipid content fairly high.

Notes. Fresh material has not been available. *Crocicreas gramineum* var. *incertellum* is distinguished from the type variety of *C. gramineum* by the shorter asci and ascospores, and the pale brown hyphae of the medullary exciple (see also CARPENTER 1981: 121). This pigmentation has some similarities with that of *Crocicreas starbaeckii* (see below).

10. *Crocicreas starbaeckii* (Rehm) S.E.Carp.

Characters derived from herbarium specimens. Apothecial morphology: Apothecia pale brown, urceolate, stipitate; margin non dentate. Apothecial anatomy: Rhomboid crystals on the outer surface of the apothecium abundant, rarely absent. Paraphyses 2–3(–4) µm wide, cylindrical or often sublanceolate, sometimes subapically swollen, with obtuse apices, exceeding the asci by c. 3–10 µm. Asci 42–52 µm long, 4–5.5 µm wide, short-stalked, with croziers. Ascus apex (fig. 4) slightly conical; apical thickening weakly developed, 0.5–1 µm tall; amyloid ring of *Conchatium*-type, 0.7–1 µm wide, 0.7–1.2 µm tall (immature state), 0.5–0.7 µm tall (mature state), not or slightly spreading at the top, I_{Lugol} + blue (euamyloid), I_{Melzer} + blue, strongly protruding into the ascoplasm; with "foramen immarginé" after spore discharge. Ascospores 0-septate, 7.5–10 µm long, 1.4–2 µm wide; lipid content fairly low.

Additional characters derived from fresh material. Apothecial morphology: Apothecia greyish-white. Apothecial anatomy: Paraphyses 2–4(–5) µm wide. Asci 47–67 µm long, 4.7–5.4(–6.5) µm wide. Ascospores 6–11 µm long, 1.6–2.4 µm wide. Vacuolar bodies (in apical cells of paraphyses and in cortical hyphae of ectal exciple) more or less abundant, small, roundish, strongly refractive.

Notes. The hyphae of the medullary exciple are dark olivaceous brown and granulate and resemble those of *Crocicreas gramineum* var. *incertellum*. The paraphyses of *C. starbaeckii* are often sublanceolate and may represent a transition to the lanceolate paraphyses of *C. gramineum*.

Discussion and conclusions

According to CARPENTER (1981: 23) the genus *Crocicreas* is mainly characterized by the ectal exciple consisting of long-celled, subparallel, occasionally branched and anastomosed hyphae immersed in a gelatinous matrix (textura oblita).

Within the genus *Crocicreas* three different types of amyloid ascus apical apparatus have been found: the *Calycina*-type in the type species of the genus (*Crocicreas gramineum*), the *Conchatium*-type in the *C. cyathoideum*-group (*C. cyathoideum*, *C. dolosellum*, *C. fraxinophilum*, *C. starbaeckii*), and the *Hymenoscyphus*-type in the *C. coronatum*-group (i.e. *C. calathicola, C. coronatum, C. culmicola*). A non-amyloid ascus apical apparatus occurs in *C. megalosporum* (Rea) S.E. Carp. var *megalosporum* and in *C. megalosporum* var. *gramineum* (Rehm) S.E.Carp. (see also CARPENTER 1981).

Crocicreas in its narrow sense has asci with obconical apical rings of the *Calycina*-type. The *Conchatium*-type of the *C. cyathoideum*-group shows certain similaries to this type but lacks the apical spreading and the hemiamyloid reaction of the basal part. The *Hymenoscyphus*-type of the *C. coronatum*-group is clearly distinguishable from both types. It has a parallel-cylindrical, apically fading amyloid ring. The ascus apex is more or less papillate and strongly thickened. It has the same very characteristic shape as the ascus apex in the non-amyloid asci of *C. megalosporum*. Therefore it is suggested that the latter has evolved as a reduction of the amyloid ring of the *Hymenoscyphus*-type. Further leotialean genera which comprise taxa with amyloid asci beside others with inamyloid asci are *Lachnellula* P.Karst., *Mollisia* (Fr.) P.Karst., *Pyrenopeziza* Fuckel and *Vibrissea* Fr. (BARAL 1987 b: 438, tab. 6; NANNFELDT 1976: 284, 285).

The variation in the ascus apical apparatus of *Crocicreas* might support a subdivision of the genus into two separate lineages: *C. gramineum* and the *C. cyathoi-*

deum-group as the first lineage, and the *C. coronatum*-group and *C. megalosporum*-group as the second lineage. The differences observed in the ascus apex are correlated with the spore width and to a certain extent with the shape of the paraphyses and the colour of the apothecia (see tab. 1). The first group of species has narrow ascospores (1.5–3.5 µm) while the second group has broad ascospores (3.0–6 µm). These two lineages do not correlate with the occurrence of teeth at the apothecial margins or the spore septation (see tab. 1): features which formerly were used for the generic delimitation of *Cyathicula* and *Phialea/Conchatium* (e.g. REHM 1892, SVRCEK 1979).

The genus *Allophylaria* (P.Karst.) P.Karst. (type species: *A. sublicoides* (P.Karst.) P.Karst.) is very similar to *Crocicreas*, for instance in the ectal exciple consisting of relatively long-celled, parallel hyphae immersed in a gelatinous matrix (textura oblita). According to CARPENTER (1981: 18) it should be distinguished from the latter by the strongly parallel, non-ramifying hyphae of the ectal exciple seen in surface view. Species of *Allophylaria* lack rhomboid crystals and are often substipitate. Their asci have an obconical shaped amyloid ring with a pronounced lateral spreading, i.e. of the *Laetinaevia*-type. The ring shows a red-brown (hemiamyloid) iodine reaction (BARAL 1987 b: 126–127, fig. 21, 22). This type of amyloid ring may represent a transition to the *Calycina*-type of *Crocicreas gramineum* and indicates a close relationship between the two genera.

A very useful tool to distinguish *Allophylaria* from *Crocicreas* is found in studying the refractive vacuolar bodies of living cells of paraphyses and cortical hyphae of the ectal exciple: The vacuolar bodies of *Allophylaria* (including the type species) are always large and elongate (BARAL & KRIEGLSTEINER 1985: 94; BARAL 1992: 365, fig. 28: *A. nervicola* (Velen.) Baral) while those of *Crocicreas* are smaller, roundish and occur in a much higher number in the cells (BARAL 1992: 365, fig. 27: *C. fraxinophilum*). Unfortunately there are no data available about the vacuolar bodies in *C. gramineum*, the type species of *Crocicreas*, and therefore the generic circumscription of *Allophylaria* and *Crocicreas* still remains somewhat uncertain.

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Tab. 1: Diagnostically relevant features in *Crocicreas*.

Characters	*C. gramineum*	*C. cyathoideum*-group	*C. coronatum*-group	*C. megalosporum*-group
Apothecial stalk	-/+	+/++/+++	++/+++	++
Apothecium colour (herbarium material)	dark brown	pale brown to dark brown	pale (yellow)-brown	pale brown
Teeth at the apothecial margin	-	-/+	-/+	-
Rhomboid crystals	-	-/+	-/+	-
Shape of the paraphyses	lanceolate, cylindrical	cylindrical, sublanceolate	cylindrical	cylindrical
Vacuolar bodies	?	+	+	+
Type of the amyloid ring at the ascus apex	*Calycina*	*Conchatium*	*Hymenoscyphus*	no amyloid ring
Foramen marginé and papillate ascus apex	-/(+)	-/(+)	+/(-)	+/(-)
Croziers at the ascus base	+	-/+	+	-
Ascospore septation	-	-/+	-/+	-
Ascospore width [µm] (dead state)	1.5–3.5	1.5–3.0	3.0–5.5	3.0–6.0

Fig. 1–7. The ascus apices of *Crocicreas gramineum* and of selected taxa of the *C. cyathoideum*-group (drawn from dead asci, mounted in I $_{\text{Lugol conc}}$, if not otherwise indicated).
1. *Crocicreas gramineum* var. *gramineum* (*Gustafsson*; UPS): immature (a), mature (b). – 2. *Crocicreas gramineum* var. *gramineum* (REHM, Ascomyceten 767; M): immature (a), dehisced (b). – 3. *Crocicreas gramineum* var. *incertellum* (SYDOW, Mycotheca germanica 505; M): immature (a), mature (b). – 4. *Crocicreas starbaeckii* (*Deny*; hb. BARAL 3434): immature (a), mature (b), dehisced (c–d). – 5. *Crocicreas cyathoideum* var. *cyathoideum* (TRIEBEL, Microfungi exs. 4; M): immature (a), mature (b), dehisced (c). – 6. *Crocicreas dolosellum* (*Stabenau*; hb. BARAL 5188): mature, drawn from living asci, mounted in water (a), mature (b–c), dehisced (d). – 7. *Crocicreas fraxinophilum* (*Baral*; hb. BARAL 2947): mature, drawn from living asci, mounted in water (a), immature (b), mature (c), dehisced (d–e).

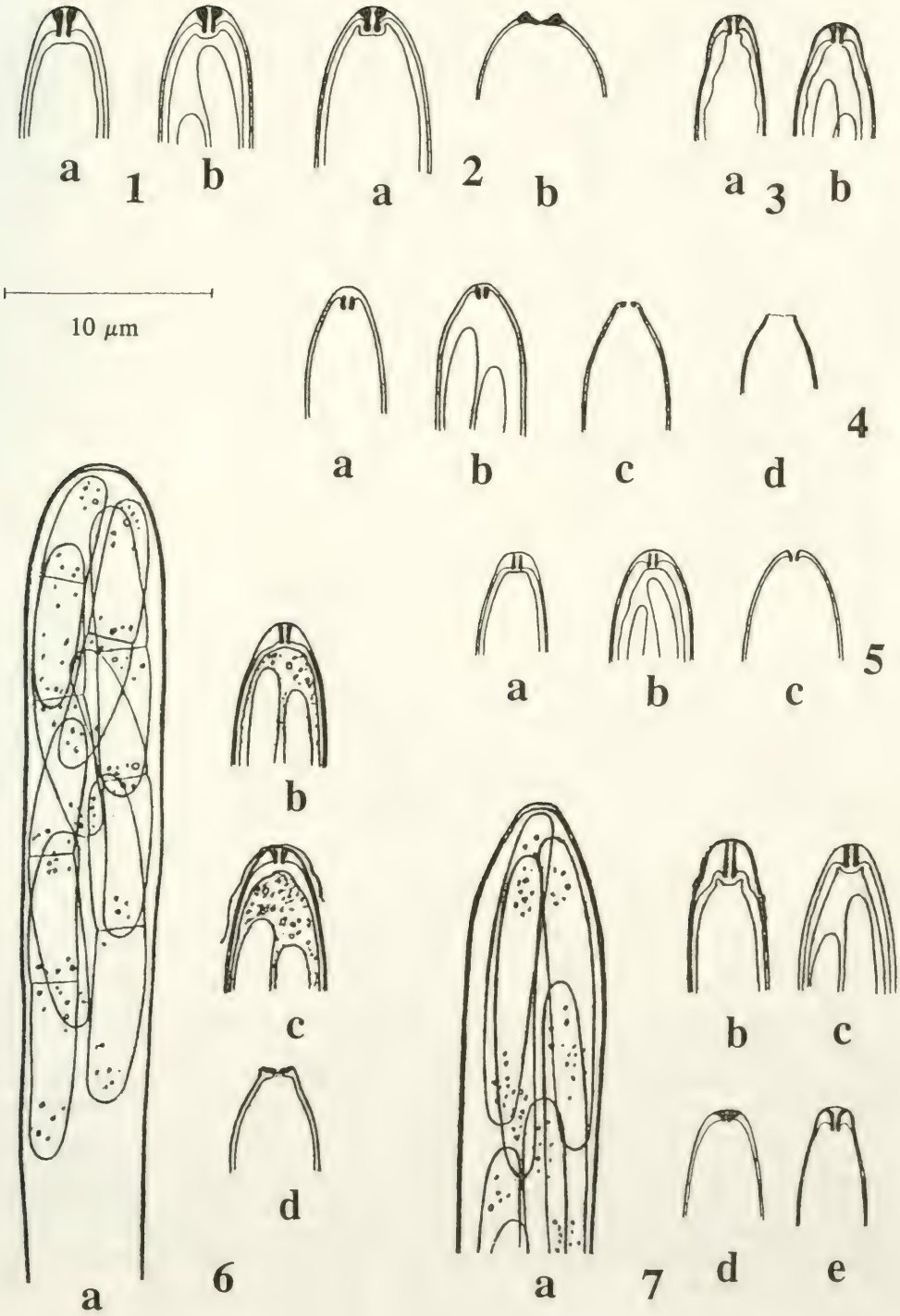
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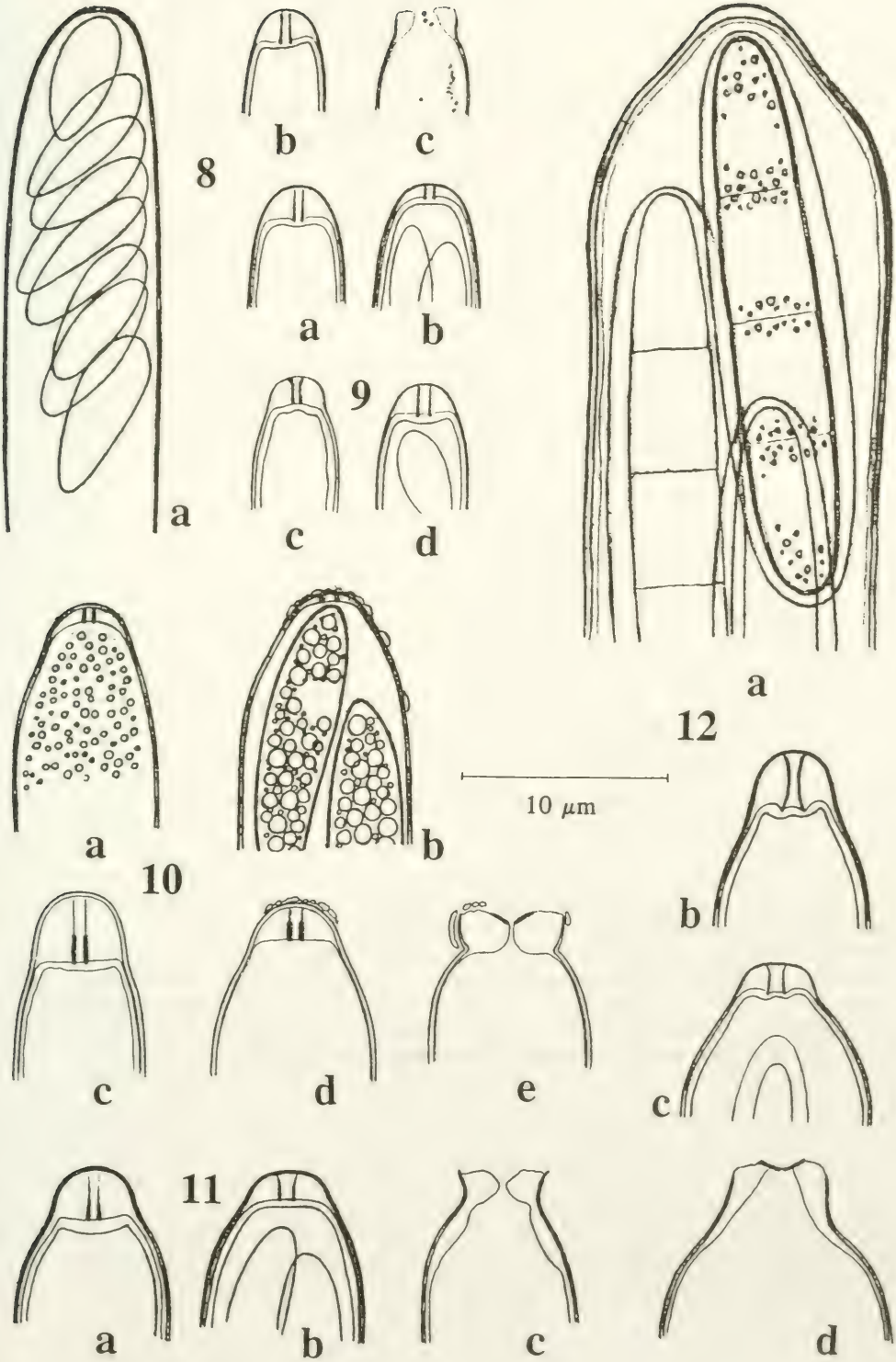
Fig. 8–12. The ascus apices of selected taxa of the *C. coronatum*-group (drawn from dead asci, mounted in $I_{Lugol\ conc}$, if not otherwise indicated).
8. *Crocicreas calathicola* (*Rücker & Lohmeyer*; hb. BARAL 4243): mature, drawn from living asci, mounted in water (a), immature (b), dehisced (c). – 9. *Crocicreas calathicola* (*Collin*; hb. BARAL 4047): immature (a, c), mature (b, d). – 10. *Crocicreas coronatum* (*Baral*; hb. BARAL 3067): immature, drawn from living asci mounted in $I_{Lugol\ conc}$ (a), mature, drawn from living asci mounted in $I_{Lugol\ conc}$ (b), immature (c), mature (d), dehisced (e). – 11. *Crocicreas coronatum* (*Baral*; hb. BARAL 2942): immature (a), mature (b), dehisced (c). – 12. *Crocicreas culmicola* (*Baral*; hb. BARAL 2929): mature, drawn from living asci, mounted in water (a), immature (b), mature (c), dehisced (d).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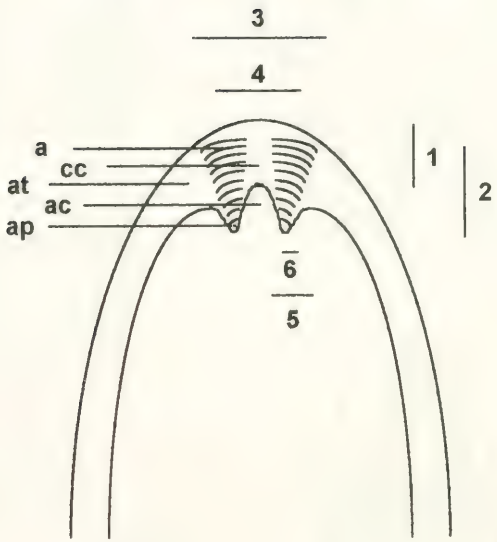

Fig. 13. Ascus apex components and measurements (terms and abbreviations according to BELLEMÈRE 1994: 116, fig. 2 and VERKLEY 1992: 5).
Annulus (= ring) (a); apical chamber (= ocular chamber) (ac); annular protrusion (forming a "pendatif") (ap); apical thickening (at); central cylinder (= axial mass) (cc). Tallness of the apical thickening (1); tallness of the annulus (2); maximal diameter (= maximal width) of the annulus (3); minimal diameter (= minimal width) of the annulus (4); maximal thickness of the annulus (5); minimal thickness of the annulus (6).

Notes on Loasa (Loasaceae) I–III

M. WEIGEND

Abstract:
WEIGEND, M.: Notes on Loasa (Loasaceae) I–III. – I. Loasa triphylla Juss. and allies in the series Saccatae Urb. & Gilg. – II. "Cajophora" venezuelensis Steyerm. and its allies. – III. Proper use of the name Loasa grandiflora Desr. and a new species from Colombia. – Sendtnera 3: 219–253. 1996. –ISSN 0944–0178.

URBAN and GILG (1900) adopted six out of twelve names available for members of the *L. triphylla* Juss.-group and reduced them to mere varietal rank. Based on field studies and a revision of both the types and other herbarium collections elevation of three of these varieties to subspecific and of two others to specific rank (*Loasa roseoalba* Weigend, *Loasa aequatoriana* (Urb. & Gilg) Weigend spp. nov.) is proposed. Two additional species, *Loasa bicornuta* Weigend and *Loasa ramirezii* Weigend spp. nov. are described from Peru and southern Colombia respectively. This group of closely related taxa has its next relatives in *Loasa humboldtiana* Urb. & Gilg and *Loasa dyeri* Urb. & Gilg from Ecuador.
Based on field studies and a comparison with other Loasas from Colombia/ Venezuela *Cajophora venezuelensis* Steyerm. und *C. larensis* Steyerm. are reevaluated. *C. venezuelensis* is recombined to *Loasa venezuelensis* (Steyerm.) Weigend while *C. larensis* is reduced to synonymy under the latter name. Two new taxa related to *L. venezuelensis* are described from the Sierra Nevada de Santa Marta and the Serranía de Perijá respectively: *Loasa santa-martae* and *Loasa perijensis*. They are characterized by falcate floral scales resp. divided stipules, characters new for the family. These three taxa here presented are closely related to each other and should be considered as a third taxonomical group closely related to the series *Loasa* ser. *Alatae* Urb. & Gilg and *Loasa* ser. *Saccatae* Urb. & Gilg.
The name *Loasa grandiflora* Desr. has been misused for a Peruvian taxon at least since URBAN & GILG's monography (1900). The type specimen, collected by Joseph De Jussieu (P-JUSS), comes from Ecuador, probably from Pichincha/ Prov. Pichincha and corresponds to the more recent taxa *Loasa acuminata* Wedd. and *Loasa aurantiaca* Urb. & Gilg. These are therefore reduced to synonymy and *L. grandiflora* is established as valid name of the taxon. The species mistakenly called *L. grandiflora* therefore has to take the name *Loasa cymbopetala* Urb. & Gilg. *Loasa* ser. *Grandiflorae* Urb. & Gilg is circumscribed more precisely as a group of basally woody shrubs with fruits opening by a longitudinal slit, fleshy petals and staminodia with basal appendages. One new species of this group, *Loasa peltiphylla* Weigend sp. nov. from Pasto/ Nariño/ southern Colombia, is

described: It is easily distinguished from all known Loasas by its peltate leaves and black lenticels on the stem.

Resumen:
URBAN y GILG (1900) adoptaron seis de los doce nombres disponibles para miembros del grupo de *Loasa triphylla* Juss. y las reducieron a nivel de meras variedades. Sobre la base de estudios de campo y la revisión de las colecciones nuevas en los herbarios y todos los tipos, se propone el nivel subespecífico para tres de estas formas y se eleva a nivel específico las dos más distintas (*Loasa roseoalba* Weigend, *Loasa aequatoriana* (Urb. & Gilg) Weigend spp. nov.). Se describen dos nuevas especies, *Loasa bicornuta* Weigend, *L. ramirezii* Weigend, spp. nov., de Perú y del Sur de Colombia respectivamente. Este grupo coherente de especies y subespecies está estrechamente relacionada con *Loasa humboldtiana* Urb. & Gilg y *Loasa dyeri* Urb. & Gilg del Ecuador.
Sobre la base de estudios de campo y la revisión de material de otras Loasas del área, se redefinen las especies *Cajophora venezuelensis* Steyerm. y *C. larensis* Steyerm. C. venezuelensis está recombinada como *Loasa venezuelensis* (Steyerm.) Weigend y *C. larensis* se reduce a la sinonímia bajo este nombre. Se describen dos especies nuevas muy características de la Sierra Nevada de Santa Marta y de la Serranía de Perijá: *Loasa santa-martae* y *Loasa perijensis*. Se distinguen por poseer escamas nectaríferas falcadas y estípulas divididas respectivamente, caracteres nuevos para la subfamilia. Estas tres especies están estrechamente relacionadas entre sí y representan un tercer grupo independiente cerca de las series *Alatae* y *Saccatae*.
El uso establecido del nombre *Loasa grandiflora* Desr. para una especie peruana es ilegítimo. El tipo collectado por Joseph de Jussieu proviene del Ecuador, probablemente del volcán Pichincha/Prov. Pichincha. Es idéntico con las especies más recientemente descritas *Loasa acuminata* Wedd. y *Loasa aurantiaca* Urb. & Gilg. Estos se reducen a sinonímia y se establece *Loasa grandiflora* como nombre legítimo del taxón. La especie mal interpretada del Perú recibe el nombre *Loasa cymbopetala* Urb. & Gilg. La serie *Grandiflorae* Urb. & Gilg está redefinida como un grupo de Loasas caracterizadas por un hábito arbustivo con tallos leñosos, pétalos carnosos y estaminodios con un apéndice basal. Se describe otra especie de este grupo, *Loasa peltiphylla* Weigend sp. nov. de Pasto/Nariño/Sur de Colombia, la cual se caracteriza por sus hojas peltadas y lenticelas negras en el tallo.

I. Loasa triphylla Juss. and allies in the series Saccatae Urb. & Gilg

Introduction

The genus *Loasa* is widespread in South and Central America and *L. triphylla* Juss. sensu URBAN & GILG (1900) of the series *Saccatae* Urb. & Gilg is by far the widest ranging taxon in the genus. Its distribution stretches from southern Mexico through Central America, Venezuela, Columbia and Ecuador right down to northern Peru. Nomenclature and valid subdivision of this species complex, however, remain highly problematic. By 1900, when URBAN and GILG revised the group in their study on Loasaceae, a total of some 12 names were available, some based on wild collections and some on cultivated material, some validly published and others only used in manuscript. URBAN & GILG reduced these species to 6 infraspecific entities, giving them mere varietal status while all to happily creating new species in other

groups of *Loasa* and *Cajophora*. In naming these varieties a number of older names were reduced to synonymy, others illegitimately transferred to new taxa and new ones were created. The relation between these varieties and to neighbouring species remained unclear and some highly dubious herbarium specimens were included in the study, obscuring the extent of geographical separation and mistakenly reporting the presence of *L. triphylla* right down to southeastern Brazil and Chile.

Based on field work in Colombia and a revision of herbarium material from most major herbaria, including all the extant potential type material, a new subdivision of the group is here proposed and the relations to neighbouring species are discussed.

Discussion

L. triphylla was originally described by A.L. De Jussieu from a drawing by Morainville, an artist who accompanied Joseph de Jussieu on the Condamine voyage, and the plants brought back by Humboldt and Bonpland (JUSSIEU 1804: 27). All this material is preserved at P-JUSS and bears labels reading "Perou". Indeed all the *Jussieu* collections from South America bear that label though most of his *Loasas* undoubtedly were collected in central Ecuador. There is good reason to believe that the drawing of *L. triphylla* was made from plants collected near Quito (where J. De Jussieu spent a lot of time, DIELS 1937: 48), as it shows a large-flowered form, coinciding with what later came to be described as *L. vulcanica* Andr. The Humboldt & Bonpland collections were collected "in Loxam Peruvianorum", i.e. Loja, the present day province of southern Ecuador, but in those days considered as part of Peru. These collections represent a type very closely corresponding to the drawing mentioned above, but bearing considerably smaller flowers.

So the typical form of *L. triphylla* is the morph encountered between the provinces of Pichincha and Loja in southern and central Ecuador. The northern representatives of this morph ("*L. vulcanica*") closely resemble *L. triphylla* var. *aequatoriana* Urb. & Gilg (see below) in floral features. The large and small flowered forms of what is here considered as the type subspecies *L. triphylla* subsp. *triphylla* were separated into different varieties by Urban & Gilg who invalidly called the one (based on the Humboldt & Bonpland material) "*var. genuina*" and the other (based on *L. vulcanica* André) "*var. vulcanica*". As the protologue is accompanied by an illustration clearly based on the drawing by Morainville (i.e. corresponding to *L. vulcanica*), the latter would really have to be considered the type variety if any such division was made.

The varieties by Urban & Gilg

There is a number of other forms in the *L. triphylla* complex, also considered as varieties by Urban & Gilg, which are, however, well differenciated on the basis of capsule position (erect to pendent) and outline (cylindrical to shortly conical), leaf structure (trifoliolate to bipinnate), flower size and shape of the floral scales. The latter, though extremely useful in determining the delimitation of series and species groups in *Loasa*, is of limited use in closely related species. The scales of *L. triphylla* generally have two horn-like projections on their back which are either always present and very conspicuous (*L. bicornuta)* or rather small (*L. aequatoriana*) or extremely variable (*L. triphylla* subsp. *papaverifolia*). In *L. triphylla* subsp. *papaverifolia* they are either very well developed and nearly equalling the scale or completely absent, i.e. the scale has a smooth, rounded back. *L. triphylla* subsp. *rudis*, the

widest ranging subspecies (Panama to Mexico) never has horns on the back of its scales.

The other characters named above depend on the growing conditions of the plant: Well nourished plants growing in shady positions tend to have larger, more strongly dissected leaves and larger flowers than sun-burnt, starved individuals. Poorly developed individuals of morphs with normally bipinnate to pinnate leaves can have trifoliolate laminas.

The interpretation of capsule outline and position is also problematical as all capsules are initially pendent and conical. Differences are only seen in fully mature capsules which are often absent from herbarium material. Well developed specimens from different geographical regions are, however, very clearly distinct and readily told apart. Yet these differences are small in comparison to those between other species of *Loasa,* especially in the ser. *Saccatae* Urb. & Gilg itself, but also in neighbouring groups (ser. *Grandiflorae* Urb. & Gilg and ser. *Alatae* Urb. & Gilg). Subspecific rank is therefore proposed for three of the morphs encountered in the *L. triphylla* complex while specific rank is attributed to the three most distinctive ones.

According to this concept there is a sequence of three subspecies:

– The typical subspecies, is restricted to the area between Loja and Pichincha in Ecuador. It is a erect herb 50–80 cm high and characterized by mostly trifoliolate leaves and strictly erect, cylindrical capsules.
– *L. triphylla* subsp. *papaveriflora* has bipinnate leaves and erect, widely cylindrical to ovoidal capsules. It grows on the eastern slopes of the Andes from Baños (Prov. Cotopaxi) northward to Maldonado (Prov. Carchi) and then again from the departments Huila and El Valle in Colombia up to Antioquia and Norte de Santander and right into the Venezuelan Andes, up into the coastal ranges near Carácas. It shows rather peculiar distributional gaps in southern Colombia (Nariño – where *L. ramirezii* Weigend sp. nov., a close ally with entire leaves takes its place) and in the Sierra Nevada de Santa Marta (César – where the spectacular *L. schliemiana* and another new, undescribed taxon, both from the series *Saccatae*, replace it). Geographically and characterwise subsp. *papaverifolia* is central to the *L. triphylla* complex.
– *L. triphylla* subsp. *rudis* goes from northern Panama right up into Mexico (Chiapas, Verapaz). It is the most robust of all subspecies characterized by large, bipinnate leaves with coarsely serrate margins, large, widely clavate to ovoidal, erect capsules and stems up to 2 m high. Its flowers are charcterized by petals apically protracted into two filiform appendages and floral scales with an unappendaged back. While the presence of dorsal horns on the scales is typical for most other subspecies, *L. triphylla* subsp. *papaverifolia* shows considerable variation in this character. The specimens from Ecuador, Venezuela and the major part of Colombia have dorsal horns, some specimens from Antioquia (as far as sufficiently well preserved to show this character) lack these projections: Thus the Antioquian specimens approach subsp. *rudis* in this feature. These two subspecies also share emarginate petals which are apically protracted into two filiform appendages (illustrated in WOODSON & SCHERY 1970: 37, Fig. 9). These threads are short in Antioquian material of subsp. *papaverifolia* and well developed in subsp. *rudis.* The differences between subsp. *papaverifolia* and subsp. *rudis* are of a purely quantative nature (degree of leaf dissection, stem height, flower size) but they are separated by a large distributional gap: The northernmost collections of subsp. *papaverifolia* come from Medellín (Antioquia, northeastern Colombia) and the southernmost collections of subsp. *rudis* from Chiriquí (northern Panama).
– a different species occurs south of *L. triphylla* subsp. *triphylla* in southern Ecuador and northern Peru: *L. bicornuta* sp. nov. is a straggly herb of up to 1.5 m

high with trifoliolate to pinnate leaves, comparatively large flowers (3.5 cm in diameter) and conical capsules, which are strictly upright from a horizontal pedicel, i.e. the pedicel is bent 90 degrees at the base of the capsule.
– *L. triphylla* var. *chelidoniifolia* Urb. & Gilg occurs from Bolívar south to Loja within the distributional range of the typical subspecies. It is, however, very distinctive in having strictly trifoliolate leaves with sessile, esetulose leaflets with entire to subentire margins (versus petiolate, setose leaflets with mucronate to deeply serrate leaflets in all other morphs) and flowers lacking the horn-like projections on the scales plus conical, erect fruit from an erect pedicel. It is therefore proposed to separate this taxon from *L. triphylla* and give it specific status under the name *Loasa roseoalba* (sp. nov., distribution see fig. 8.). This taxon approaches *L. humboldtiana* Urban & Gilg, also lacking the horns on the scales (but scales do differ in shape and lack an apical callus in the latter, see fig. 5) and having trifoliolate leaves.
– The var. *aequatoriana* Urb. & Gilg from Pichincha is also given specific status under the name of *Loasa aequatoriana* stat. nov. This is the tallest of these taxa growing up to 3.5 m high in undisturbed mistbelt forest and differs also in always having pendent fruit. (Distribution see fig. 8.).

L. triphylla in the series *Saccatae*

L. triphylla Juss. sensu Urban & Gilg, i.e. including all the above named morphs, is closely related to the Ecuadorean taxa *L. humboldtiana* Urb. & Gilg and *L. dyeri* Urb. & Gilg (two very poorly understood species which are only known from the respective type collections by R. Spruce and one more recent collection each). All these taxa are characterized by trifoliolate to pinnate leaves and white, pendent flowers with horizontally spreading or reflexed petals. Outside the *Saccatae* the group clearly related to *L. triphylla* is represented by *L. venezuelensis* (Steyerm.) Weigend and its allies in northeastern Columbia and northwestern Venezuela. The position of *L. venezuelensis* and its allies in the genus *Loasa* is discussed elsewhere in more detail (*Cajophora venezuelensis* and its Allies, see below).

The majority of the other members of the ser. *Saccatae* are Peruvian, with only three northern outliers in Colombia (one of them here described), and share the white, pendant flowers with reflexed petals, but are characterized by entire to variously dissected to (bi-)pinnatifid, but never trifoliolate or pinnate leaves. *L. ramirezii* is of some interest in this context: It has flowers nearly indistinguishable from *L. triphylla* subsp. *papaverifolia* and it replaces the latter in southern Colombia (southern Valle de Cauca and Nariño, fig. 8), yet it has the undivided leaves of the Peruvian *Saccatae*. Seedlings of *L. triphylla* subsp. *papaverifolia* and of *L. ramirezii* cultivated at Munich Botanical Garden both had the primary leaves opposite and undivided, this being probably the primitive character state in this group of Loasas (shared with the neighbouring ser. *Alatae* and ser. *Grandiflorae*). *L. ramirezii* can thus be interpreted as either having retained this primitive character or – rather more likely – to be derived from ancestors in the *L. triphylla* agg. and having reverted to the primitive (and juvenile) leaf shape.

It is wrong to attribute alternate leaf position to the *Saccatae* in general as URBAN & GILG (1900: 219) did: The primary leaves are opposite and only the leaves in the inflorescence are alternate as in all Loasas of northern South America. Cultivated at Munich Botanical Garden *L. triphylla* subsp. *papaverifolia* developed three opposite pairs, the fourth leaf pair was inserted at slightly different heights along the stem, the following leaves – where the inflorescence started – were alternate. *L. ramirezii* showed exactly the same pattern. L. *triphylla* subsp. *triphylla*, however, has at best one pair of opposite leaves, and so have many *Saccatae* from Peru: These are very

short-lived annuals of drier habitats who have reduced the vegetative part of the stem and consist only of a rooted, foliose inflorescence – with alternate leaves.

Detailed morphological descriptions and ecological notes on the taxa here named will be provided in the respective floristic treatments.

Key to *Loasa* ser. *Saccatae* of Ecuador, Venezuela, Columbia and Central America

The ten taxa here recognized of this group are characterized by:
- annual habit with succulent stems streaked with dark green
- white, pendent flowers with white, deeply cymbiform petals reflexed into a horizontal plane
- ovate floral scales not or very shortly protracted into wings apically

1 Leaves not divided to midvein 2
– Leaves trifoliolate to bipinnate 3
2 Sepals lanceolate, petals white, to 1 cm long (Southern Colombia) ***L. ramirezii*** Weigend
– Sepals ovate, petals greenish-white, 2.5 cm long (only northern Colombia, Sierra Nevada de Santa Marta) ***L. schliemiana*** Planch. & Triana
3 Scales without apical callus, rectangular from ovate base, esaccate or slightly saccate, without dorsal horns 4
– Scales with apical callus, ovate to cymbiform, often with two dorsal horns 5
4 Scales slightly bisaccate basally, leaves trifoliolate with leaflets with cuneate base, margins mucronate ***L. humboldtiana*** Urb. & Gilg
– Scales esaccate, leaves pinnate with leaflets with truncate base, margin serrate ***L. dyeri*** Urb. & Gilg
5 Leaves always trifoliolate, rarely with additional leaflets in basal leaves 6
– Leaves pinnate to bipinnate 8
6 Leaflets subsessile, subentire; scales without dorsal horns ***L. steyermarkii*** Weigend
– Leaflets petiolate, serrate or mucronate, scales with well developed dorsal horns 7
7 Fruit cylindrical, pedicel erect ***L. triphylla*** subsp. ***triphylla*** Juss
– Fruit conical, erect from horizontal pedicel ***L. bicornuta*** Weigend
8 Fruit conical, pendent, flowers to 5 cm in diam. ***L. aequatoriana*** (Urb. & Gilg) Weigend
– Fruit clavate to cylindrical, erect to horizontal, flowers smaller 9
9 Scales 0.4 × 0.15 cm, usually with dorsal horns, largest leaflets 8–9 × 2 cm, petals if emarginate with filiform appendages no longer than 0.1 cm ***L. triphylla*** subsp. ***papaverifolia*** (Humb., Bonpl.& Kunth) Weigend
– Scales 0.7 × 0.3 cm, always without dorsal horns, largest leaflets 16 × 3 cm, petals always emarginate and with filiform appendages to 0.3 cm long ***L. triphylla*** subsp. ***rudis*** (Benth.) Weigend

Clave para la determinacion de *Loasa* ser. *Saccatae* de Ecuador, Colombia, Venezuela y America Central

Se acceptan diéz especies de este grupo que se characterizan por:
- tallos suculentos con líneas oscuras
- flores péndulas con pétalos blancos, profundamente naviculiformes, reflejos en un plano horizontal
- escamas nectariferas ovoideas no aladas en el apice

1 Hojas no profundamente divididas 2
– Hojas trifoliadas-pinnadas 3
2 Sépalos lanceolados, pétalos blancos, de hasta 1 cm de largo (Southern Colombia) ***L. ramirezii*** Weigend
– Sépalos ovados, pétalos blanco-verdosos, de hasta 2.5 cm de largo (Sierra Nevada de Santa Marta, Northern Colombia) ***L. schliemiana*** Planch. & Triana
3 Escamas sin callos apicales, base ovada á rectangular, no sacadas-levemente sacadas, sin cuernos dorsales 4
– Escamas con callos apicales, ovadas ó cymbiformes, a menudo con dos cuernos dorsales 5
4 Escamas levemente sacadas basalmente, hojas trifoliadas con hojuelas de base cuneada y margen mucronado ***L. humboldtiana*** Urb. & Gilg
– Escamas no sacadas, hojas pinnadas con hojuelas con base truncada y margen serrado ***L. dyeri*** Urban & Gilg
5 Hojas siempre trifoliadas, rara vez con hojuelas addicionales en hojas basales 6
– Hojas pinnadas á bipinnadas 8
6 Hojuelas subsessiles, subenteras, escamas sin cuernos dorsales ***L. steyermarkii*** Weigend
– Hojuelas pecioladas, serradas o mucronadas, escamas con cuernos dorsales bien desarolladas 7
7 Fruto cilindrico, pedicelo erecto ***L. triphylla*** subsp. ***triphylla*** Juss
– Fruto conico, erecto con pedicelo horizontal ***L. bicornuta*** Weigend
8 Fruto conico, péndulo, flores de hasta 5 cm de diam. ***L. aequatoriana*** (Urb. & Gilg) Weigend
– Fruto clavado-cilindrico, erecto-horizontal, flores mas pequeñas 9
9 Escamas 0.4 × 0.15 cm, generalmente con cuernos dorsales, hojuelas mayores 8–9 × 2 cm, si los pétalos son emarginados apendices filiformes no mayores de 0.2 cm ***L. triphylla*** subsp. ***papaverifolia*** (Humb., Bonpl.& Kunth) Weigend
– Escamas 0.7 × 0.3 cm, nunca con cuernos dorsales, hojuela mayor 16 × 3 cm, pétalos siempre emarginados y con apendices filiformes hasta 0.5 cm ***L. triphylla*** subsp. ***rudis*** (Benth.) Weigend

Formal Taxonomy

1a. ***Loasa triphylla*** Juss. subsp. ***triphylla***, in Ann. Mus. Natl. Hist. Nat. 5: 27, pl. 5, t. 2. 1804. Syntypes: Loxa, *Humboldt & Bonpland 1837*; Loxa, *Humboldt & Bonpland s.n.*; Cardamine urens in Peruvia, drawing by Morainville. **Lectotype** (here designated): Drawing of "Cardamine urens in Peruvia", by Morainville (P-JUSS!). Syntypes: [Ecuador. Loja] Loxa, *Humboldt & Bonpland 1837* (P-JUSS! Iso: P! P-BONPL!).

= *L. vulcanica* André in Illustr. Hortic. 25: 302. 1878.Type: "in Cordillera occidentali Andium Equatoriensium ad pedem montis ignivomi Corazon, circa 1500–1800 m, junio 1876", *André s.n.* Lectotype (here designated): [Ecuador. Pichincha] Am Fuße des Corazón, *André s.n.* (K!, Iso: NY!).

= *Loasa wallisii* Maxim., in Gartenflora: 357. 1878. Type: Semina hoc nomine a hortulano D. Platz accepta, probabiliter a D. Wallis collecta et tunc patria Columbia vel civitates alpinae adjacentes. Lectotype (here designated): in Maximowicz, Gartenflora 27: 357. pl. 958. 1878).

– *L. triphylla* Juss. var. *genuina* Urb. & Gilg, in Monogr. Loasac. – Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur.76: 238. 1900. nomen invalidum.

non *L. triphylla* Ruiz & Pavon in Flora Peruviana, et Chilensis 5. – Anal. Inst. bot. Cavanilles 16/17: 18, t. 450, f. a . 1958. (= *L. roseoalba* Weigend, sp.nov.).

Fig.1

There is an excellent colour drawing by Morainville preserved at P-JUSS which is cited in the protologue as being the one the name was originally based on (– the corresponding herbarium collections of J. De Jussieu were partly lost in Loja – DIELS 1937: 48). It shows all the crucial characters of the typical subspecies and is therefore here designated as lectotype. There are quite a number of specimens from Loja by Humboldt and Bonpland in the Paris herbaria. Unfortunately only few of them have a collection number and while it is possible that most if not all of them where collected together only the ones with the collection number 1837 are here accepted as belonging to one set selected as syntypes. The lectotype is not chosen from this material as it represents a form with slightly smaller flowers than the true *L. triphylla* (the Joseph De Jussieu plant) and if it should become necessary to separate the two forms in future the accepted use of the name would have to altered.

L. vulcanica is the northern form of this plant with larger flowers and is identical with *L. wallisii* Maxim. also described from cultivation. As far as can be deduced from description and drawing both may ultimately have come from the same seed source.

Specimens seen:

Ecuador.Chimborazo: Alausí, 3000 m, *Jameson s.n.* (W); Pumallacta, *Humboldt & Bonpland s.n.* (P) – Alausí to Nariz del Diablo, 2100 m, *Asplund 6871* (F, S). – Loja: 25 km from Loja to San Lucas, 2200 m, *Dodson 649 & Thien* (MO). Chuquiribamba, *Poortman 164* (P), Loxa, *Humboldt & Bonpland s.n.* (P) – "In loxam peruvianorum", *Humboldt & Bonpland 1837* (P, P-BONPL, P-JUSS).

1b. *Loasa triphylla* Juss. subsp. ***papaverifolia*** (Humb., Bonpl. & Kunth) Weigend **stat. nov**.
Basion.: *L. papaverifolia* Humb., Bonpl. & Kunth in Plantae Aequinoctiales 3: 404. 1824. *Loasa triphylla* var. *papaverifolia* (Humb., Bonpl. & Kunth) Urb. & Gilg, in Monogr. Loasac. – Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur. 76: 239. 1900. **Lectotype**: [Colombia. Tolima] Inter Quebrada de Toche et Los Galiegos, Quindío, *Humboldt & Bonpland* (P-BONPL!; Iso: P!, P-BONPL!).
= *L. chelidoniifolia* Benth., in Bot. Voy. Sulph.: 101. 1844. Holotype: [Colombia. Nariño] Mangles on the River Mira, *Barclay 863* (K!).

Vernacular name: ortiguilla de tigre (Ecuador, fide *Eggers*), ortiga blanca, pringamoza (Colombia).

This is a rather variable subspecies, more characterized by quantitative differences than qualitative ones. It is close to subsp. *rudis* in the north and subsp. *triphylla* in the south. Future field studies will hopefully help to clarify the precise southern distributional limit.

Specimens seen:

Colombia. Antioquia: Mpio Caramanta, Vereda Hojas Anchas, 9.8 km towards Supía from Caramanta, *Bernal 1724* (COL) – Medellín, Angelopolis, *Toro 900* (NY, UNA) – Medellín, Titiribi, *Toro 1195* (NY) – Medellín, Fredonia, *Toro 849* (UNA); Mpio San Vicente del Caguán, Los Monos, 1550 m, *de Robira s.n.*, (HUA). – Norte de Santander: Loso north of Toledo, 2200–2240 m, *Killip 20392 & Smith* (BM, F). – Santander: Vicinity of Charta, 2000

m, *Killip 19022 & Smith* (NY). – Risaralda: Pereira, Parque Regional Ucumurí, el Ceilán, *F.Gonzalez 1686* (COL). – Quindío: San Juan near the border between Antioquia and Quindío, 2000 m, *Th. von Bayern 200* (M) – Mpio Calarca, Finca El Calabozo, 1850 m, *Arbelaez 1524* (quind) – Salento, Río Boquía, 1600–1900 m, *Killip 8837 & Hazen* (NY). – Cundinamarca: Between San Bernardo and Sasaima, 1600–1800 m, *Cuatrecasas 9590* (NY) – Laguna Pedro Palo above Finca San José, 32km from Mosquera to La Mesa, 2000–2250 m, *Gentry 17153 & Fallen* (MO). – Tolima: San Miguel to La Lora, *Hazen 9672* (NY) – Ibague to Cajamarca, *Alston 7717* (BM) – between Calamarca and Filo Divisorio, 2400 m, *Killip 34527 & Varela* (BM) – La Trinidad, Libano, 1100–1300 m, *Pennell 3320* (NY) – inter Quebrada de Toche et Los Galiegos, Quindío, *Humboldt & Bonpland s.n.* (P,P-BONPL). – El Valle de Cauca: Calamar, margin of Río Bugalagrande, 1680 m, *Cuatrecasas 20531* (F). – Huila: Balsillas on Río Balsillas, 2000–2100 m, *Rusby 806 & Pennell* (NY). – Nariño: Mangles, on the River Mira, *Barclay 853* (K).

Venezuela. Lara: Distr. Jiménez, between La Encrucijada and the path to P.N.Yacambú de El Blanquito, 10–15 km SSE of Sasanare, 1750 m, *Steyermark 103512 et al.* (NY) – P.N.Yacambú, *de Rojas 1757* (F) – P.N. Yacambú, *Xena 623* (F). – Tachira: Las Delicias to Paraguita, on Río Táchira, 1675–1980 m, *Steyermark 574* (F, NY).

Ecuador. Carchi: Maldonado, 90 km W of Tulcán, 1500 m, *Balslev 1961* (NY) – NAPO: Quito to Baeza, 34 km E of Papallacta, 1.2 km N of junction of roads to Baeza and Río Agrío, 1800 m, *Croat 58473* (MO). – Pichincha: Quito, Nanegal, Bosque Protectora Maquipucana, 1300–1400 m, *Webster 29274* (AAU). – Tunguragua: Ambato, Baños, Cocha de Santa Rosa, 2300 m, *Heinrichs 98* (M) – Baños, opposite Agoyan, 1800 m, *Weigend & Horn 3802* (M) – Baños, above Bizcaya, *Weigend & Horn 3804* (M, QCA, QCNE).

1c. *Loasa triphylla* Juss. subsp. ***rudis*** (Benth.) Weigend **stat. nov**.

Basion.: *Loasa rudis* Benth. in Pl. Hartweg.: 75. 1839. *L. triphylla* var. *rudis* (Benth.) Urb. & Gilg, in Monogr. Loasac. – Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur. 76: 239. 1900. **Holotype**: [Guatemala] Santa María, *Hartweg 1040* (K!).

= *L. rhoeadifolia* Schlechtd., Linnaea 14: 382. 1840. Type: [Mexico] Cuesta Grande de Chuquillo, *Schiede s.n.*

= *L. bipinnata* Donn.Sm., Coult. Bot. Gaz. 23: 7. 1897. Syntypes: San José to Desamparados, *Pittier 1314;* Llanos de Alanjuelita, 1000 m, *Tonduz 1477*(BM!). Lectotype (here designated): [Costa Rica, San José] San José to Desamparados, *Pittier 1314* (BM!; Iso: BR).

Vernacular name: chichicaste (Mexico, Nicaragua, Guatemala), ortiga, pringamoza (Costa Rica, Panama).

Fig. 3

As *L. triphylla* subsp. *rudis* is geographically well isolated there is no danger of confusing it with subsp. *papaverifolia*, to which it is morphologically rather similar. In spite of its wide distribution it is extremely homogeneous and may have gone through a "genetic bottleneck" when colonizing Central America.

Specimens seen:

Mexico. Veracruz: Mpio. Yecuatla, between Naolinco and Misantla, 13 km S of turnoff Yecuatla, 1200 m, *Nee 26369 et al.* (F, NY, XAL). – Orizaba: Prov. Oaxaca, *Giesbreght 50* (P). – Chiapas: Mpio Rayón, Nuevo Jolistahuacán to Tapiula, Puerto del Viento, 2000 m, *Breedlove 9002* (NY) – Rincón Chamula near Nuevo Jolistahuacán, 2000 m, *Clarke 272* (NY);

Tacaná, Talquián, 2200 m, *Breedlove 31699* (NY) – Volcán Tacaná, 2 km N of Colonia, Toguián, 1700 m, *Croat 47140* (MO) – dito, *E.Matuda 2486* (NY).

Guatemala. Alta Verapaz: Mountains of Tactic, road to Tamahú, 1500–1650 m, *Standley 71225* (F). – San Marcos: W Slope of Sierra Madre, near Fraternidad, between San Rafael Pie de la Cuesta and Palo Gordo, 1800–2400 m, *Williams 2705 et al.* (F, G, NY), *26237* (F, G, NY) – 6 km S of Tajumulco, NW slopes of Volcán Tajumulco, 2300–2800 m, *Steyermark 36612* (F) – Above El Porvenir, El Rodeo, 1400 m, *Sharp 46108* (F) – Río Cabós, Malacatán, 3000 m, *Standley 68891* (F) – 13 km NW of El Porvenir, between Finca El Porvenir and Loma Corona, Volcán Tajumulco, 1300–2000 m, *Steyermark 37723* (F). – Quetzaltenango: Between Sta María de Jesús and Calahuachí, S slopes of Volcán Sta María, Quebrada San Gerónimo, Finca Pirineos, 1300–2000 m, *Steyermark 33366* (F) – Santa María de Jesús, along Río Samala, 1500–1650 m, *Standley 84646* (F) – Volcán Sta María, Finca El Foro – Finca San José Patulín, 1510–1560 m, *Förther 2454* (M) – Aguas Amargas, Volcán de Zumil, 2450–2850 m, *Standley 65428* (F) – *Standley 83309* (F) – Boxantín, SE of San Martín Chile Verde, 2400 m, *Standley 83719* (F) – San Martín Chile Verde to Colomba, above Mujalá, 1800 m, *Standley 85551* (F). – Retalhuleu: Finca Helvetia, 1800 m, *Muenscher 12432* (F).

Nicaragua. Jinotega: Mpio Jinotega, Tuma Valle, Hacienda La Trampa, *Hawkes et al. 2149* (F).

Costa Rica. Alajuela: Vara Blanca de Sarapiquí, N slope of Cord.Central, between Volcanoes Poás and Barba, 1770 m, *Skutch 3368* (MO, NY) – Río La Paz Falls on road to Pto.Viejo, 1400–1500 m, *Burger et al. 11859* (AAU, F) – Penas Blancas, 950 m, *Hepper 1477* (BM). – Heredia: N of San Isidro, NE of Concepción, 1500 m, *Khan et al. 1271* (BM) – Vicinity of Bajo La Hondura, between Paracito and Río Claro, 1100–1400 m, *Croat 44509A* (MO). – San José: El General, 1160 m, *Skutch 2936* (MO, NY) – San Isidro del General along Interamerican Highway, 1800 m, *Burger 7058 & R.L.Liesner* (NY, MO, F) – Carlos Rojas on E slopes of Volcán Irazú, 2500 m, *Durkee 76–135* (F) -- Río Claro Valley, Río La Hondura, La Palma NE of San Jeronimo, 1000–1200 m, *Burger 9076 & Gentry* (F) – Finca Porvenir, *Utly & Utly 2890* (F) – Qebrada de los Yases between La Guaria and Palmilera, 1700 m, *Jiménez 1460* (F, NY) – Valle de Los Arcangeles, Irazú Volcán, 1500 m, *Pittier 13049* (BM). – Cartago: 12 km S of Turrialba, 4 km SE of Pejibaye on Río Gato, 700 m, *Liesner 14269* (MO) – Santa Cruz, Bridge over Río Aquiares, 1500 m, *Lent 1o68* (F, MO) – Tapantí, Río Grande de Orosí, 1200 m, *Jiménez 1622* (F); 3 km E of Cachi, 980 m, *Almeda 3211 et al.* (F). – Puntarenas: Zona Protectora Las Tablas, San Vito Coto Brus, Sabalito, Río Negro, 1300–1800 m, *Mora 44* (MO, F) – Cantón Coto Brus, Las Mellizas, 1700 m, *Herrera 3450* (MO,F) – Monteverde, Bull Pen, Reserva Forestal, 1500 m, *Gentry 48789 et al.* (MO).

Panama. Chiriquí: Upper Río Chiriquí Viejo near Cerro Punta, *G.White 39* (MO) – 3.7 km E of bridge NE of Cerro Punta on road to Bajo Grande, 2250–2400 m, *W.D.Stevens 18202* (NY), *Mori 5731 & Kallunki* (MO) – Monte Rey above Boquete, *Croat 15671* (NY) – Boquete, F.Collins Finca, 2000 m, *Ebinger 721* (F, MO) – Boquete, Bajo Chorro, 2000 m, *Davidson 277* (F, MO) – Casita Alta, Volcán Chiriquí, 1500–2000 m, *Woodson 936 et al.* (F, MO) – *D.Díaz 39* (F, MO) – Fort Clayton, Canal Zone, 2500 m, *Blum 2670 & Dwyer* (MO) – Boquete Trail, Cerro Respinga, 2000–2500 m, E of Cerro Punta, *Gentry 5954* (MO), *Tyson 6666* (MO) – Las Lagunas W of El Hato del Volcán, 2400 m, *Hamilton 926 et al.* (MO), *Folsom 5977 & Page* (MO) – Lower slopes of Barú, E of Bajo Chorro, 2000 m, *Hammel 2943 (MO).*

2. *Loasa aequatoriana* (Urb. & Gilg) Weigend **stat. nov**.

Basion.: *Loasa triphylla* var. *aequatoriana* Urb. & Gilg, in Monogr. Loasac. – Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur. 76: 240. 1900. **Lectotype** (here designated): [Ecuador] In Andium nemoribus, 3000 m, *Jameson 427* (P!; Iso: BM!, E!).

Fig. 2

The Paris material is here selected as lectotype as representing the best specimen of the Jameson collections.

This species shows strong morphological and ecological differenciation from *L. triphylla* s. str. Its inflorescences are always branched with curved branches, so as to have a number of open flowers at a time in one plane. The capsules are always pendent. Whereas all other species here described grow in open, often disturbed ground, *L. aequatoriana* is found in pristine forest habitats, growing along streams and reaching heights of over 3.5 meters. Its succulent stems are nearly free of setae and those present are very short (0.5 mm vs 1.5–2 mm) and parallely reflexed (vs erect).

Specimens seen:

Ecuador. Pichincha: Between Nono and Nanegal NW of Quito, 17 km NW of Nono, 2000 m, *Croat 3845* (MO) – Chiriboga on road from Quito to Santo Domingo de los Colorados, 1800 m, *Asplund 8680* (MO,S) – dito, Cerón 29086 (QAP) – 15 km W of Aloag on road to Santo Domingo de los Colorados, 2700 m, *Argent 534* (E) – Old road from Chillagallo-San Juan-Chiriboga-Empalme, Hacienda Las Palmeras, margin of Río de las Palmeras, 1850 m, *J.Jaramillo 5963* (NY) – Río Guajalito N.R., La Soledad, Quebrada La Soledad, 1800 m, *Weigend & Jaramillo 3937* (M, QCA, QCNE) – dito, *Jaramillo & Zak 587* (QCA). – without exact locality: In andium nemoribus, 3000 m, *Jameson 427* (BM, E, P).

3. *Loasa bicornuta* Weigend **sp. nov.**

Holotype: Peru. Dpto Piura: Prov. Huancabamba, Palimbala (Canchaque-Huancabamba), *Sagástegui 8137, Cabanillas & Dios* (AAU!; Iso: G!, MO!).

Fig.4

Herba annua caulis usque ad 150 cm altus, pilis minimis glochidiatis et setis erectis obtectus; folia petiolo usque ad 3,5 cm longo, laminis ad 5–13 cm longis, 5–12 cm latis, trifoliolata vel pinnata, pinnis breviter petiolatis ellipticis et apice abrupte acuminatis, marginibus ± regulariter serrato-dentatis; floribus 5-meris in inflorescentiam terminale multifloram dispositis, 3,5–5 cm in diametro, petalis reflexis, albis, 1,5–2,3 cm longis; capsula conica vel ovoidea, 1,8–2 cm longa, superne 0,7 cm lata, setis brunneis dense obtecta, stricte erecta, pedicelli usque ad 5 cm longo recurvati instructa.

This species is characterized by very long, hornlike nectar sacs on the back of its scales (name!) and a cavity at the base of the staminodia. This latter feature is not found in any of its relatives. It reaches from northern Ecuador just into the southern part of the province of Loja in Ecuador, without overlapping either with *L. roseoalba* or *L. triphylla* subsp. *typica*.

Specimens seen:

Ecuador. Loja San Pedro de la Bendita to Cisne, km 8, 1900 m, Ollgard et al. 90703 (LOJA) – Pindal, San Francisco, *Vivar et al. 2809* (LOJA, M) – dito, *Vivar et al. 850* (LOJA) – Celica, 2700 m, *Vivar et al. 754* (LOJA).

Peru. Piura: Ayabaca, Yacumapapa to Cuévas, 2500 m, López 7770 et al. (NY) – Ayabaca, *Weberbauer 6424* (F) – Huancabamba, between Serrán & Canchaque, 500–600 m, *Ferreyra 10771* (MO) – Huancabamba, between Palambila & Faique, 1400–1500 m, *Ferreyra 10857*

(MO). – La Libertad: Prov.Cajamarca, Colasay, 2700 m, *Woytkowski 6894* (AAU, F, G, MO, NY).

4. *Loasa roseoalba* Weigend **sp. nov.**

Holotype: Ecuador, Bolivar, Rivulet northeast of Chillanes, 2500 m, *Weigend & Horn 3812* (M!, Iso: QCA!, QCNE, for dist.).

= *Loasa triphylla* Ruiz & Pavon, Flora Peruviae, et Chilensis 5. – Anal. Inst. bot. Cavanilles 16/17: 18. t. 450 f. a .1952. Lectotype (here designated): [Ecuador] Loasa triphylla de Huayaquil, *Ruiz & Pavon s.n.* (BM!; Iso: G!).

– *Loasa triphylla* var. *chelidoniifolia* (Benth.) Urb. & Gilg, Monogr.Loasac. – Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur. 76: 237. 1900. sensu Urban & Gilg excl. typo.

Fig.5

Herba metralis, caulibus stricte erectis superne pilis glochidiatis laxe et setis pallidis sparsissime obtectis, foliis trifoliatis, foliolis lanceolati-ellipticis, apice acuminatis et basin cuneatis, foliolis lateralibus oblique ellipticis, petiolis 2–2,5 cm longis, esetulosis, laminis pilosis, esetulosis,margine pauce mucrontis; floribus pendulis, apice caulis in inflorescentiam vel simplicem vel bifurcatam dispositis, pedicellis 2,5 cm longis, prophyllis euphylloideis, indivisis, non vel brevissime petiolatis, calycis tubo 0,3 cm longo et lato, pilis glochidiatis densissime et setis pallidis vel dense vel sparsissime obtecto, calycis lobis late ovatis, 0,6 cm longis basin 0,4 cm latis, intus glabris extus pilosis; petalis albis, cymbiformibus, 1,7 cm longis, 0,6 cm latis (profundis), squamis ovoideis, a latere visis inferne incurvatis, saccato-convexis, superne antice paullo late emarginatis lobis apicalibus late rotundatis; capsula conica 1,5 cm longa, superne 1 cm lata, dense pilosa, sparse vel dense setosa, inter lobos calycinos 3-valvis.

The name *L. triphylla* would suit this species much better than the aggregate it is currently used for, as this species is truly trifoliolate. Ruiz and Pavon were the first to employ the name, but this particular volume of the Flora Peruviana et Chilensis was only validly published in 1958 (STAFLEU & COWAN 1983, vol. 4: 983:) though basically finished before 1800. Thus the Jussieu name, published in 1804, takes priority and *L. triphylla* Ruiz & Pavon is a later homonym. The "*var. chelidoniifolia*" by Urban & Gilg is equally inadequate, being explicitly based on *L. chelidoniifolia* Benth. which is the name of a completely different plant, and referable as a synonym to *L. triphylla* subsp. *papaverifolia*.

Thus the plant has to be renamed and I propose to call it *L. roseoalba* because of the colour of its nectar scales. These are white and rose pink, while all closely related taxa have nectar scales red and yellow.

Specimens seen:

Ecuador. Bolívar: 10 km south of Chillanes, 2350 m, Boysen Larsen et al. 45488 (QCA, QCNE) – Rivulet northeast of Chillanes, 2500 m, *Weigend & Horn 3812* (M, QCA, QCNE). – Azuay: Río Gamolotal and Río Huigra on road to Molleturu, 1220–1520 m, *Steyermark 52909* (F). – Loja: Celica to Zapotillo road, km 5, 2100–2200 m, *Harling & Andersson 22448* (QCA).

5. ***Loasa ramirezii*** Weigend **sp. nov.**
Holotype: Colombia. Nariño: Mpio Tangua, 5km south of Tangua in a coffee plantation, 2600 m, *Weigend 3280 & Ramírez* (M!; Iso: COL!, PSO!).

Fig. 6

Herba annua, 0.6–1.5 m alta caulibus erectis, sparse setosis setis erectis pallidis; folia ovata 5–12.5 cm longa, 3–10 cm lata, longe petiolata (6 cm), laminis vix lobulatis, lobulis latissime triangularibus, marginis denticulatis vel subserratis, basin cordata; flores 5-meri, in apice caulis in monochasia usque ad 15-flora dispositi, pedicellis 1,2 cm longis, prophyllis euphylloideis longeque petiolatis, calycis tubo 0.2 m longo et lato, setis pallidis densissime obstructo, calycis lobis linari-lanceolatis, 0,3 cm longis, 0,1 cm latis, acutis; petalis cymbiformibus, basin unguiculatis utrinque dentis instructis, reflexis, 1 cm longis, 0,5 cm latis (vel profundis), extus setulosis; squamis erectis, anguste ovatis, convexis, luteis, collis callibus rubris ornatis; capsulis pendulis, turbinatis, 2,2 cm longis, 0,5 cm latis, dense setis pallidis obtectis.

The taxon is named after B.R. Ramírez P. from the Universidad de Nariño who discovered the plant and led me to the largest known population during my field studies.

Only four collections of this plant are known, three of them in the area of the type collection. The other specimen, collected by Lehmann in 1880, comes from the slopes of the Volcán Sotará/ El Valle.

Like most Loasas *L. ramirezii* seems to be a plant with highly specific habitat requirements growing only in partial shade in deep, humus rich soil in coffee plantations. Though extremely frequent in the place of the type collection it is absent from fields and hedges only a few hundred meters away. Like most if not all Colombian Loasas *L. ramirezii* flowers and fruits throughout the year, though the plants spread and multiply particularly during the wet season and somewhat diminish, flowering and fruiting less freely during the drier periods of the year. It is a short lived annual, rapidly growing from the copiously produced seeds.

It is easily distinguished from the other *Saccatae* of Ecuador, Colombia and Venezuela by its undivided leaves and it linear-lanceolate sepals. The only other taxon with undivided leaves in this area is *L. schliemiana* from the Sierra Nevada de Santa Marta which is very densely setose and pubescent and has greenish flowers with petals about 2.5 cm long.

Specimens seen:

Colombia. Valle de Cauca: Popayán, Western slopes of the Sotará Volcanoe, 2400 m, *Lehmann 6205* (K). – Nariño: Tangua, Tapialquer, 2250–2500 m, *Ramírez s.n.* (PSO) – 5km south of Tangua in a coffee plantation, 2600 m, *Weigend 3280 & Ramírez* (M, COL, PSO) – Tajumbina, Mpio de la Cruz, 2630 m, *Buenavides s.n.* (PSO) – Mpio Consacá, Mpio de Coriaco, 1820 m, *Ramírez s.n..* (PSO) – Mpio de Consacá, Sección de Coriaco, 1820 m, *Guarín 407* (PSO).

6. ***Loasa dyeri*** Urb. & Gilg, in Monogr. Loasac. – Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur. 76: 242 .1900. **Lectotype** (here designated) : [Ecuador. Chimborazo] Chimborazo, San Antonio, *Spruce 6183* (BM!; Iso: CBGE!, W (Photo F!).

Specimens seen:

Ecuador. Cotopaxi: Tenefuerste, Río Pilalo, 52 km from Quevedo to Latacunga, 750–1300 m, *Dodson 12244 & Gentry* (MO) – dito, *Dodson 13480 & Embree* (MO). – Chimborazo: San Antonio, *Spruce 6183* (BM, CBGE, W).

7. *Loasa humboldtiana* Urb. & Gilg, in Monogr. Loasac. – Nova Acta Acad. Caes. Leop.-Carol. German. Nat. Cur.76: 240 .1900. **Lectotype** (here designated): [Ecuador. Tunguragua] Llalla, Tungurahua, *Spruce 6002* (P !, Iso: B†: photo F!, BM!, E!, OXF!, GOET!, W!).

II: "Cajophora" venezuelensis Steyerm. and its allies

Introduction

J.A. STEYERMARK (1952: 414) described two new species of *Cajophora*, a genus not previously known from northern South America, from his own collections in the Venezuelan Andes. Only the type collections of this species existed until recently. These lack fruit and one of them (*Steyermark 56594*) has no flower either. Though there is considerable confusion regarding the generic limits of *Loasa* and *Cajophora* there can be no doubt that the affinity of the plants described by Steyermark is rather with the Loasas of northern South America than with the Peruvian and Bolivian members of *Cajophora*. This is immediately borne out by the morphology of the floral scales and leaf morphology, which clearly link *Cajophora venezuelensis* to Loasas such as the widespread *L. triphylla* Juss. complex or *L. lindeniana* Urb. & Gilg from Venezuela. Additional material of neither of these species had been collected until I had the opportunity to visit the site of the type collection of *C. venezuelensis* at Tabay near Mérida in Mérida/Venezuela and recollected (fruiting) material of this species.

From the Serranía de Perijá on the border between Colombia and Venezuela and the Colombian Sierra Nevada de Santa Marta additional material of taxa clearly undescribed and equally clearly related to *C. venezuelensis* has now come to light, greatly enhancing our understanding of this branch of Loasoideae.

Discussion

The original descriptions of *C. venezuelensis* Steyerm. and *C. larensis* Steyerm. are accompanied by drawings of the floral scales and leaves (STEYERMARK 1952: 413, fig. 86 & 415, fig. 87). The key characters differenciating the two taxa are slight differences in the degree to which the scales are winged and the supposedly alternate leaf position of *C. venezuelensis* versus an opposite one in *C. larensis*. The former clearly is within the variation of scale shape typical of *Loasa* and encountered also comparing the only three collections known of *L. perijensis* sp.nov. Leaf position is strictly opposite in *C. venezuelensis* and alternate only in the inflor-escence, like in *C. larensis* and nearly all other most Loasas. This could be observed in the wild at the type locality. Other differences in the drawings are either due to the completely different scales the plants are drawn at odd drawing mistakes (shape of staminodia). Studying the types from Field Museum no convincing differences could be found. So there does not seem to be any reason to retain these two taxa as distinct and it is

therefore proposed to sink the name *C. larensis* as geographically misleading into the more appropriate *C. venezuelensis*.

In collecting nearly mature fruit of *C. venezuelensis* these turned out to be straight, conical capsules strictly conforming to the pattern observed in the genus *Loasa*. This adds to the overal similarity in floral and vegetative characters and it therefore seems appropriate to transfer *C. venezuelensis* to the latter and rename it *Loasa venezuelensis* comb. nov. (Distribution see fig. 9).

Interestingly enough plants rather similiar to *L. venezuelensis* have come to our knowledge from the Serranía de Perijá and the Sierra Nevada de Santa Marta. The plants from the Sierra Nevada de Santa Marta are superficially similar to *L. venezuelensis* and have been identified as such (e.g. by M. Poston, Washington). Closer examination immediately reveals some good differenciating characters: In addition to differences in the indumentum and leaf margins, the capsules in *L. santa-martae* sp. nov. are much smaller and the scales are conspicuously protracted into two wings 0.3 cm long while the leaves are nearly esetulose. (Distribution see fig. 9).

The plants from the Perijá, though clearly allied, stand out by their rather short, blunt petals (versus acuminate ones 1.5 times longer in the other two species), ovate capsules (versus conical), up to 10-flowered inflorescences (versus single- or two-flowered ones), scales with 2 conspicuous horns on their backs (versus concave scales) and by being densely covered by very dark, blackish-brown setae on inflorescence and calyces (versus lax covering with pale to reddish brown setae) and stipulate leaves (versus estipulate ones). They are thus highly distinctive and a new species is here proposed to accommodate them: *Loasa perijensis*. This is the first species of *Loasa* to be discovered in the Serranía de Perijá. The material used in this study was kindly provided by S. Tillett, Universidad Nacional de Venezuela at Caracas, who also facilitated detailed collector's notes on the plants. There are slight differences between the three collections seen: *Tillett 747-947* and *747-459* are very similar while *Tillett 747-1943* shows smaller inflorescences, less conspicuously horned scales and a less dense indumentum. From comparing this variation with that encountered in other species of *Loasa* it does not seem justified to separate this morph taxonomically. All of these collections come from the same area, (distribution see fig. 9). It is interesting to see that *L. perijensis* is another species with stipulate leaves, a character already known from the Peruvian *Loasa stuebeliana* Urb. & Gilg (ser. *Saccatae*).

The three species here discussed clearly form a natural assemblage. The combination of bipinnatisect leaves and large, campanulate, yellow flowers is not encountered elsewhere in the genus. This group is restricted to the mountain ranges between the Sierra Nevada de Mérida and the Sierra Nevada de Santa Marta, with one species each per mountain range. The affinities of this group are with two different series in *Loasa*: They share the deeply dissected leaves and saccate to horned scales of ser. *Saccatae* Urb. & Gilg while also sharing the variously winged scales and the large, yellow, campanulate flowers and (sub-)perennial character of ser. *Alatae* Urb. & Gilg. *L. venezuelensis* and its allies have capsules opening with apical valves only, a character shared with ser. *Alatae* and ser. *Saccatae* (and separating these three groups from ser. *Grandiflorae* Urb. & Gilg). Thus *L. venezuelensis*, *L. perijensis* and *L. santa-martae* are best considered as a homogeneous group of equal rank to the other series in northern South America. As, however, the delimitation of genera and subgeneric entities within *Loasa* is anything but clear at the moment no formal recognition as a new series is here proposed. The Urban & Gilg concept is here perpetuated but as a working concept while a more natural subdivision is wanting.

Key to the *Loasa venezuelensis* group

This key is for Loasas which are characterized by yellow flowers and deeply divided leaves. They are restricted to northwestern Venezuela and northeastern Colombia

1 Leaves with large stipules, petals to 3 cm long, calyx and stem very densely covered with very dark setae (black or dark brown), inflorescences many-flowered (Serranía de Perijá) ***Loasa perijensis*** Weigend
– Leaves without stipules, petals 5 cm long, calyx and stem less densely covered with brown setae, inflorescences usually with one or two, very rarely up to three flowers 2
2 Scales with very narrow back (falcate), apically winged, esaccate dorsally (Sierra Nevada de Santa Marta) ***Loasa santa-martae*** Weigend
– Scales with wide, rectangular back, not or very shortly winged apically, with two basal sacs (Venezuelan Andes) ***Loasa venezuelensis*** (Steyerm.) Weigend

Clave para la determinacion de las Loasas afines a *L.venezuelensis*

Estas Loasas se caracterizan por poseer hojas profundamente divididas y flores amarillas. Se encuentran solamente en el noroeste de Venezuela y el noreste de Colombia.

1 Hojas con estípulas grandes, pétalos de hasta 3 cm de largo, caliz y tallo recubiertos por muchisimos pelos urticantes oscuros (negros-marrones), inflorescencias con muchas flores (Serranía de Perijá) ***Loasa perijensis*** Weigend
– Hojas sin estípulas, pétalos de hasta 5 cm de largo, cáliz y tallo con pelos urticantes marrones, inflorescencias con una o dos, rara vez tres flores 2
2 Escamas muy estrechas, falcadas, aladas en el ápice, sin sacos dorsales (Sierra Nevada de Santa Marta) ***Loasa santa-martae*** Weigend
– Escamas rectangulares, sin alas apicales o con alas muy cortas, con dos sacos dorsales en la base (Andes de Venezuela) ***Loasa venezuelensis*** (Steyerm.) Weigend

Formal Taxonomy

1. ***Loasa venezuelensis*** (Steyerm.) Weigend **comb. nov.**
Basion.: *Cajophora venezuelensis* Steyerm., in Contrib. to the Flora of Venezuela. – Fieldiana 28 (2): 414. 1952. **Holotype**: Venezuela. Merida: Mérida, La Isla at Tabay[1)], 2280–2745 m, *Steyermark 56594* (F!).
= *Cajophora larensis* Steyerm., Contrib. to the Flora of Venezuela. – Fieldiana 28 (2): 412. 1952. Holotype: Venezuela. Lara: Between Buenos Aires and El Callado valley, above Humocaro Alto, 2285–2740 m, *Steyermark 55528* (F!).

Fig. 12 E–H

L. venezuelensis grows up to three meters high in dense, impenetrable bamboo thickets where it is supported by surrounding vegetation and also found on the side of the path where it is self-supported and much lower (1.5 m).

L. venezuelensis is not at all frequent in the area and only two adult and some 5 young plants were encountered. It is thus much rarer than *L. lindeniana* growing in the same area at slightly higher altitudes and forming extensive stands with dozens of

1) The area formerly called "La Isla" is now known as "La Mucuy" and lies within the P.N. Sierra Nevada.

individuals. Yet the vegetation type where *L. venezuelensis* grows is anything but very accessible and it is highly likely that more specimens of this taxon could be found, probably also in other moist forests of the region.

Specimens seen:

Venezuela. Lara : Between Buenos Aires and El Callado valley, above Humocaro Alto, 2285–2740 m, *Steyermark 55528* (F). – Mérida. La Mucuy at Tabay, P.N.Sierra Nevada, 2800 m, *Weigend 2805* (MERC, VEN, M) – Mérida, La Isla at Tabay, 2280–2745 m, *Steyermark 56594* (F).

2. *Loasa perijensis* Weigend **sp. nov.**
Holotype: Venezuela. Zulia. Distr. Maracaibo, Sierra de Perijá, Serranía de Valledupar, Campamento "Monte Viruela", 3000–3150 m, *Tillett 747-1159* (M!, Iso: VEN!, MYF!).

Fig. 10,11

Frutex usque ad 2 m altus, caulibus dense retrorsum setosis, setis rufo-nigrescentibus 0,15–0,2 cm longis; foliis ambitu triangulari-ovatis, oppositis, supremis (in inflorescentiam) alternis, petiolis 8–12 cm longis, dense retrorsum setosis, basin stipulatis, laminis pinnatipartitis, 22 cm longis, 18 cm latis, in utroque latere 5-lobatis, lobis anguste ovatis vel oblongo-lanceolatis, pinnatilobatis, lobulis grosse serratis; floribus pentameris, apice caulis in monochasiam saepe basin bifurcatam usque ad 6-floram dispositis, pedicellis 1,5 cm longis, prophyllis sessilibus triangulari-ovatis, ad 2,5 cm longis, pinnatisectis; calycis tubo 0,5 cm longo et lato, setis ad 0,3 cm longis brunneis nigrescentibus densissime obtectis, calycis lobis ovato-lanceolatis, 0.5 cm longis, basin 0,3 cm latis, integerrimis, dorso setosis et pilis glochiadiatis obtectis, petalis ± planis, aurantiacis, late ovatis, basin in utroque latere dentatis, 2,8 cm longis et 1,9 cm latis, extus setosis et pilosis, intus parcissime pilosis, squamis inferne incurvatis, dorso bisacctis vel bicalcaratis, superne manifeste bialatis, alis 0,3 cm longis, 0,25 cm latis, ovatis; capsulis turbinato-ovoideis, 2,5 cm longis, apice 1 cm latis, densissime setis nigrescentibus obtectis.

This is one of the most distinctive species of the genus and unmistakeable by the combination of stipulate and dissected leaves. It is a shrubby plant with lignescent stems and reaches the upper limit of forest vegetation in the Serranía de Valledupar, Colombia.

Specimens seen:

Colombia. César: East of Manaure, Quebrada de Florida Blanca, 2700–2800 m, *Cuatrecasas & Castañeda 25227* (COL).

Venezuela. Zulia: Distr. Maracaibo, Sierra de Perijá, Serranía de Valledupar, Campamento "Monte Viruela", 3000–3150 m, *Tillett 747-1159* (MYF, Iso: VEN, M) – Campamento "Frontera V", headwaters of Río Guasare, 2700–2800 m, *Tillett 747-1043* (M, MYF) – Westside of Cerro Laminado, 5 km north of Buena Vista, headwaters of Río Apón, 3300–3650 m, *Tillett & Hönig 747-947* (M, MYF).

3. *Loasa santa-martae* Weigend **sp. nov.**
Holotype: Colombia. Magdalena. Sierra Nevada de Santa Marta, Mpio San Pedro, Headwaters of Río Sevilla near the Finca Cebolleta, 3000 m, *Burbidge 311* (E!, Photo M).

Fig.12 A–D

Frutex usque ad 3 m altus, caulibus subscandentibus vel suberectis, sparse setosis; foliis ambitu triangulari-ovatis, oppostis, supremis (in inflorescentiam) alternis, petiolis 5 cm longis, sparse retrorsum setosis, laminis bipinnatipartitis, 12 cm longis 1 cm latis, lobis late lanceolatis grosse serrato-dentatis, in utroque latere 5-6-lobatis, parce setosis et pilosis; floribus 5-meris, calycis tubo 0,7 cm longo et lato, setis rufis vel flavescentibus obtecto, calycis lobis ovato-lanceolatis longe acuminatis 1,5 cm longis, basin 0,7 cm latis, intus subglabris extus sparse setosis, petalis ± planis, lanceolatis acuminatis, bene evolutis 4,5 cm longis, medio 2,5 cm latis, extus sparse setulosis, squamis inferne incurvatis, dorso bisaccatis, superne manifeste bialatis, alis 0,6 cm longis, 0,2 cm latis, ovatis; capsulis breviter conicis, 1,2 cm longis superne 1,3 cm latis.

The Burbidge collections had to be selected as type as it is the only specimen with fruit and flower. The specimens from COL had not yet been received when this diagnosis was prepared.

This new species is known from only a few collections from the northeastern Sierra Nevada, where it seems to coexist with the virtually unknown *L. karsteniana* (probably a member of the ser. *Grandiflorae* Urb. & Gilg). In the drier southeastern Sierra Nevada the genus is instead represented the predominantly Peruvian *Loasa* ser. *Saccatae*, e.g. *L. schliemiana* Planch. & Triana. The falcate scales, i.e. scales where the normally broad back is reduced to nothing but a narrrow ridge, are unique in Loasaceae.

Specimens seen:

Colombia. Magdalena:Watershed between Ríofrio and Quebrada de Páramo, 3350 m, *Jaramillo et al. 5523* (COL) – 1 km NW of Quebrada de la Laguna Ríofrío towards Pico José Hilario, 3400 m, *Forero & Kirkbride 619* (COL) – headwaters of Río Sevilla, *Barclay & Junjibioy 6708* (COL) – path from Cebolleta to Páramo; 2400–3100 m, *Castañeda 7101* (COL) – Sierra Nevada de Santa Marta, Mpio San Pedro, Headwaters of Río Sevilla near the Finca Cebolleta, 3000 m , *Burbidge 311* (E).

III: Proper use of the name L. grandiflora Desr. and a new species from Colombia

Introduction

L. grandiflora is one of the oldest names in the genus *Loasa* published by LAMARCK (1789: 580). Desroussoux, who prepared the chapter on Loasas, explicitly based his description of *Loasa grandiflora* on a plant collected by Joseph De Jussieu in the mid-18th century and preserved at the Jussieu herbarium in Paris. This plant, like almost all of Jussieu's collections of Loasaceae preserved at P-JUSS and contrary to the labels reading "herbier de Perou", was undoubtedly collected in what is today Ecuador. A.L. DE JUSSIEU (1804) clearly based his specific concept on the J. De Jussieu specimen of *L. grandiflora*, but also mistakenly quoted a – truly Peruvian – collection by Dombey as being conspecific.

When WEDDELL compiled his Chloris Andina (1861, Vol. 2: 220) he relied on A.L. De Jussieu and compared his material of *Loasa* with the Dombey material only, rightly concluding that *Jameson 135* from central Ecuador was not conspecific with the Dombey plant from Peru, and described the former as *L. acuminata*. His use of these names was perpetuated by the monographers of Loasaceae URBAN & GILG (1900: 202) who again considered the Peruvian specimen as type of *L. grandiflora* – without consulting the Jussieu specimen and ignoring the clearly inconsistent pictures – while accepting Weddell's *L. acuminata* as a good Ecuadorean species. They even created yet another species from a Lehmann collection from northern Ecuador, naming it *L. aurantiaca*.

Discussion

Comparison of the type material of all three species, the Dombey material from Geneva and Paris, new collections from all major herbaria and integration of this information with observations in the wild in southern Colombia lead to the conclusion that all three of the entities named above are really conspecific, while the Peruvian material from Dombey belongs to a separate taxon.

L. grandiflora Desr. is clearly the oldest name and takes priority. The illustrations in A.L. DE JUSSIEU (1804: 24, pl. 4, t. 2) and TURPIN (1816–1829: pl. 116) are unmistakably based on the Jussieu specimen of this plant – showing it with horizontally spreading petals (J. De Jussieu had completely opened the naturally campanulate flower to show its interior, but this was not subsequently realized by the respective artists). The types of *L. acuminata* and *L. grandiflora* are next to identical and there is a fair chance that they both came from the same area, as J. De Jussieu is known to have spent a lot of time in Quito and is likely to have collected in its surroundings, i.e. on Pichincha, where *Jameson 135* comes from (DIELS 1937: 48). Recent collections from this area show a considerable variation in vegetative characters, especially leaf size and outline. The Lehmann collections from Tulcán, Prov. Carchi, northern Ecuador are perfectly matched by some of these and it is impossible to retain *L. aurantiaca* Urb. & Gilg as a separate taxon – by renaming it (in naming *L. aurantiaca* Urban and Gilg created a homonym to *L. aurantiaca* Loudon (LOUDON 1840: 1246), which renders their name illegitimate.).

L. grandiflora Desr. is a shrubby plant with coriaceous, strictly opposite leaves and plane, fleshy petals clearly different from the Peruvian species represented by the Dombey collection. The latter is a herbaceous plant with thin leaves which are alternate on the stem and form a basal rosette. Its petals are deeply cymbiform, setose on the back and membranaceous. This latter plant, considered as *L. grandiflora* by Weddell, Urban & Gilg, Macbride and all recent workers, is left orphaned. URBAN (1910) did, however, describe a new species of *Loasa* from a Weberbauer collection from central Peru under the name of *L. cymbopetala*. MACBRIDE (1941) rightly recognized this species as coinciding with their and his concept of *L. grandiflora*, reducing it to synonymy under the latter. With *L. grandiflora* Juss. redefined, *L. cymbopetala* Urb. has to stand as the valid name of this plant. Numerous recent collections of this species are known, all from central Peru, and these correspond well both to Dombey and to the type photograph preserved at Field Museum of the Berlin specimen of *L. cymbopetala*. Dombey accompanied Ruiz & Pavón on their collecting trip in Peru, collecting in central Peru, inland and north of Lima (DAHLGREN 1940: 8).

Loasa ser. *Grandiflorae* Urb. & Gilg

L. grandiflora is central to a group of species which has been formally assigned series rank by Urban & Gilg (1900: 192). Its redefinition makes it much more typical of that group than it previously was: The *Grandiflorae* have so far been considered as very close allies to two other northern South American series, the ser. *Alatae* Urb.& Gilg and ser. *Saccate* Urb.& Gilg. This may be true for *L. cymbopetala* which recalls characters of the series *Alatae* in some aspects. The typical *Grandiflorae* occurring from Ecuador to Costa Rica, however, are highly distinctive. Urban and Gilg defined them only on the basis of their floral scales, which are apically protracted into erect wings unlike any other group of Loasoideae. But there is a number of additional characters: Field studies reveiled that they are shrubs, with erect, lignescent branches from a decumbent, massively suckering base. They form low thickets some 1.5–2 m high and a few meters in diameter. They grow in more or less open vegetation or bamboo thickets and very strongly compete with other plants for space. The *Saccatae* and *Alatae* are erect herbs, slightly lignescent at best, branching only well above ground, developing succulent stems and brittle, succulent leaves. The leaves of the above named *Grandiflorae* are thick, often corrugated and coriaceous. Their inflorescences – far from being simple cymes as suggested by the scanty herbarium material – are branched thyrses with cymose branches. The petals are not membranaceous and cymbiform as in *Alatae* and *Saccatae*, but thick and fleshy, widely ovate and nearly flat. The staminodia are appendaged near the base, a character not found in the other two series. In northern South America it is the ser. *Grandiflorae* who reaches the upper altitudinal limit for the genus with the ser. *Alatae* and ser. *Saccatae* growing at lower altitudes.

The most interesting feature of the *Grandiflorae*, however, is their fruit morphology. It has been generally believed that all species of *Loasa* have capsules opening with apical valves while the neighbouring genus *Cajophora* has capsules opening with one or more longitudinal slits. Most *Grandiflorae*, however, have capsules opening with a longitudinal slit plus apical valves so that the initially clavate fruit opens to form something representing a grooved platform, releasing the seeds slowly as the placentae wither, exposing them to the action of wind and rain. This phenomenon, not previously reported in literature (and hardly ever visibly in dried material) clearly shows that there are a number of surprises still waiting in Loasoideae: The current generic subdivision is highly artificial.

These typical *Grandiflorae* comprise the species *L. speciosa* from Costa Rica and Panama, *L. lindeniana* from Venezuela, *L. argemonoides, L. peltiphylla, L. puracensis* from Columbia, *L. grandiflora* and *L. peltata* from Ecuador and *L. weberbaueri* from Peru. The *Grandiflorae* from Ecuador and Peru are currently under revision and future research will hopefully elucidate species limits and the precise relation between these groups.

Morphological descriptions and distribution maps will be published in floristic treatments for the respective countries, which are in preparation.

A new *Loasa* with peltate leaves from Colombia

A new taxon clearly related to *L. grandiflora* was recently collected during field studies in southern Colombia. While recalling *L. grandiflora* (its closest geographical neighbour) in some aspects, it is very well differenciated by its peltate leaves and a stem covered with black lenticels. This new species is here described as *L. peltiphylla* Weigend, sp. nov., based on the type collection by B.R.Ramírez P. from Pasto/Nariño. There is only one other species known with peltate leaves. This is *L. peltata* Urb. &

Gilg which has long been ascribed ot the Peruvian flora (MACBRIDE 1941: 161), because the label on the type collection by R.Spruce fails to mention the country. According to SPRUCE (in WALLACE 1908: 172) the precise collection locality is: Mount Mulmul just west of the Tungurahua in Central Ecuador. The plant was collected in November 1857 and represents a rather atypically small specimen of the species. Only two more collections of this plant have come to our knowledge (*Lehmann 7943 &, Pearce 1862*), both considerably more robust. Though poorly understood at present *L. peltata* is easily differenciated from *L. peltiphylla* by its wider petals, peltate leaves stalked in the centre instead much towards the upper leaf margin, lack of black lenticels and presence of dense, white pubescence on all parts of the plant.

Key to *Loasa* ser. *Grandiflorae* from Colombia, Venezuela, Panama and Costa Rica

6 species of the ser. *Grandiflorae* are here recognized. They show the following characters:
- woody plants from a decumbent base
- pentagonous or palmate, rarely peltate leaves, coriaceous, base cordate
- inflorescence branched with large, campanulate, orange flowers
- petals flat, fleshy, scales with erect wings
- staminodia with appendaged base

1 Leaves peltate 2
– Leaves not peltate 3
2 Stem with black lenticels, plant not white from dense covering with trichomes, petals 3 × 2 cm (only Pasto/Nariño/Colombia) ***Loasa peltiphylla*** Weigend
– Stem without black lenticels, plants white from covering of diverse trichomes, especially stem and lower leaf surface, petals 3 × 3 cm (southern Ecuador) ***Loasa peltata*** Urb. & Gilg
3 Petals to 2 cm long, plant to 70 cm high (El Valle to Quindío, Colombia) ***Loasa puracensis*** Killipp
– Petals 3–5 cm long, plant to 2 m high 4
4 Floral scales with incurved wings, i.e. closed above (Venezuelan Andes) ***Loasa lindeniana*** Urb. & Gilg
– Floral scale open above 5
5 Plant appearing white from covering with trichomes, petals obovate, leaves to 18 cm long (Cordillera Oriental near Bogotá, Colombia) ***Loasa argemonoides*** Juss.
– Plant not appearing from white covering with trichomes, petals ovate-lanceolate 6
6 Leaves 15–20 cm long, petals to 3 cm long (southern Nariño and Ecuador) ***Loasa grandiflora*** Lam.
– Leaves to 25 cm long, petals 4–5 cm long (Costa Rica and Panama) ***Loasa speciosa*** Standley

Clave para la determinación de las especies de *Loasa* ser. *Grandiflorae* de Costa Rica, Panamá, Venezuela y Colombia

La serie *Grandiflorae* s.str. según nuestra definición incluye 6 especies en el área con los siguientes caracteres:
- plantas lignescentes con base decumbente
- hojas pentágonas o palmadas, rara vez peltadas, coriáceas, de base cordada;

– inflorescencia ramosa con flores grandes, campanuladas, anaranjadas
– pétalos llanos, carnosos, escamas aladas con alas erectas
– estaminodios con apéndice en la base.

1 Hojas peltadas 2
– Hojas con base cordada, no peltadas 3
2 Tallo con lenticelas negras, planta verde oscura (no cubierta por trichomas blancos), pétalos 3 × 2 cm (Pasto/Nariño/Colombia) ***Loasa peltiphylla*** Weigend
– Lenticelas negras ausentes en el tallo, planta blanquecina debido a que está cubierta por numerosos trichomas blancos, especialmente en el tallo y en el envés de las hojas, pétalos 3 × 3 cm (Sur de Ecuador) ***Loasa peltata*** Urb. & Gilg
3 Pétalos de hasta 2 cm de largo, planta hasta 70 cm de alto (El Valle hasta Quindío) ***Loasa puracensis*** Killipp
– Pétalos 3–5 cm de largo, planta hasta 2 m de alto 4
4 Escamas con alas apicales incurvadas, cerradas desde arriba (Andes de Venezuela) ***Loasa lindeniana*** Urb. & Gilg
– Escamas con alas apicales erectas, abiertas desde arriba 5
5 Planta blanquecina debido a que está cubierta por numerosos trichomas blancos, especialmente en el tallo y en el envés de las hojas, pétalos obovados (Cordillera Oriental cerca de Bogotá, Colombia) ***Loasa argemonoides*** Juss.
– Planta verde oscura, pétalos ovado-lanceolados 6
6 Hojas de hasta 15(–20) cm de largo, pétalos de hasta 3 cm de largo (Sur de Nariño y Ecuador) ***Loasa grandiflora*** Lam.
– Hojas de hasta 25 cm de largo, pétalos 4–5 cm de largo (Costa Rica y Panama) ***Loasa speciosa*** Standley

Formal Taxonomy

1. ***L. grandiflora*** Desr., in Lamarck, Encycl. 3: 580. 1789.
Holotype: herb. du Perou, *Joseph de Jussieu s.n.* (P-JUSS!, photo M!, type fragment F!).
= *L. acuminata* Wedd., in Chloris Andina 2: 220. 1861. Lectotype (here designated): [Ecuador. Pichincha:] Western slopes of the Pichincha, 3650 m, *Jameson 135* (P!; Iso: BM!, E!, G!)
= *L. aurantiaca* Urb. & Gilg, in Monographia Loasacearum. – Nova Acta Caes. Leop.-Carol. German. Nat. Cur. 76: 209. 1900. Lectotype: [Ecuador. Carchi] Cordillera de Tulcán, 2800–3000 m, *Lehmann 533* (G!; Iso: BM!).
non *L. grandiflora* auct. sensu Urban & Gilg, in Monographia Loasacearum. – Nova Acta Caes. Leop.-Carol. German. Nat. Cur.76: 202. 1900. (= *L. cymbopetala* Urban & Gilg).
non *L. grandiflora* Ruiz & Pavon, in Flora Peruviae, et Chilensis 5.– Anal. Inst. bot. Cavanilles 16/17: 404, t. 440. 1958. Type: [Central Peru:] Loasa grandiflora del Peru, *Ruiz & Pavon s.n.* (MA: photo M!). (= *L. macrantha* Urb. & Gilg?)

2. ***L. cymbopetala*** Urban & Gilg, in Bot. Jahrb. 45: 435. 1911.
Holotype:[Peru.Ancash:] Prov. Cajatambo, above Ocros, 3300–3500 m, *Weberbauer 2758* (B†: photo F!).
= *L. grandiflora* sensu Urban & Gilg in Monogr. Loasac. – Nova Acta Caes. Leop.-Carol. German. Nat. Cur. 76: 202. 1900.
non *L. cymbaepetala* Ruiz & Pavon, in Flora Peruviae et Chilensis 5. – Anal. Inst. bot. Cavanilles 16/17: 409 t. 442. 1958 (= *L. acanthifolia* Adanson)

3. *Loasa peltiphylla* Weigend **sp. nov.**
Holotype: Colombia. Nariño: Mpio Pasto, southeastern slope of Morasurco range, Corriente del Granadillo, near Ojo de Agua, 3100 m, *B.R. Ramírez P. 6945* (M!; Iso: PSO, for distribution).

Vernacular name: ortiga calabaza

Fig. 13

Frutex 1,5 metralis, caulibus adscendentibus, basin decumbentibus, ad 1 cm diametientibus, lignescentibus, dense setis rufis 0.3–0.5 cm longis obtectis et lenticellis nigris ornatis; foliis oppositis, ambitu pentagonis et peltatis, petiolis 9–16 cm longis, retrorsum setosis, laminis 5-lobatis, lobis acutum triangularibus, lateralibus ad 5 cm latis et 6 cm longis, lobo centrali 8 cm lato et 10 cm longo, margine denticulato-serratis, subtus dense pilis glochidiatis obtectis et ad nervos principales setosis, supra setosis et pilosis; floribus pentameris, calycis tubo 0.5 cm lato, 0.6 cm longo, densissime setis rufis obtecto; calycis lobis basin late triangularibus superne longe acuminatis, 2.2 cm longis, basin 0.7 cm latis, pilosis et parce setosis, petalis ovatis, aurantiacis, 4 cm longis, 1.8 cm latis, extus pilosis et brevissime parceque setosis, intus glabris; squamis basin bisaccatis, superne manifeste bialatis, alis 0.6 cm longis 0.3 cm latis; 2 staminodiis, basin breviter appendiculatis et dense pubescentibus, 2 cm longis; capsula clavata, dense setis rufis obtecta.

L. peltiphylla has only been collected a few times and only in the area directly northeast of Pasto, i.e. on the Morasurco range.

It is a robust, shrubby plant with branched inflorescences and thick, coriaceous leaves. All parts of the plant are strongly urticaceous. This new *Loasa* was first encountered in dense bamboo thickets on an old landslide at 2800 m. It was subsequently recollected by Ramírez in a more open area, growing at the edge of pastures in Kikuyo (*Pennisetum clandestinum*). Habitwise it closely resembles *L. lindeniana* from Venezuela and *L. grandiflora* from just south of Pasto and Ecuador. The large, pendent, orange flowers of *L. peltiphylla* are visited by bumblebees and – like all *Grandiflorae* observed – by small *Drosophila*-like Hymenoptera (pers. comm. B.Ramírez P.). While the latter are virtually immobile and highly unlikely to effect pollination, the bumblebees might. The flowers of *L. argemonoides* are visited by hummingbirds and it remains unclear for the moment which is the effective pollinator for the *Grandiflorae* in general.

Specimens seen:

Ecuador. Nariño: Between Meneses and Pasto, 2900 m, *André 2877* (K) – Mpio Pasto, southeastern slope of Morasurco range, Corriente del Granadillo, near Ojo de Agua, 3100 m, *Ramírez 6945* (M, PSO, for distr.).

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Fig. 1: *Loasa triphylla* Juss. subsp. *triphylla* (*Asplund 6871*): A, scale, dorsal view; B. staminodium, lateral view; C, petal, lateral view, D, sepal, dorsal view; E, habit; F, "*L. vulcanica* André", cultivated at Munich Bot. Garden, habit. Scale bars: A–D 0.5 cm, E,F 5 cm.

Fig. 2: *Loasa aequatoriana* (Urb. & Gilg) Weigend (*Asplund 8680*): A, scale, oblique lateral view; B, staminodium, lateral view; C, sepal, dorsal view; D petal, lateral view; E; habit. Scale bars A–D 0.5 cm, E 5 cm.

Fig. 3: *Loasa triphylla* Juss. subsp. *rudis* (Benth.) Weigend (*Stevens 18202*): A, scale, dorsal view; B, staminodium, ventral view; C, habit. Scale bars A–B 0.5 cm, C 5 cm.

Fig. 4: *Loasa bicornuta* Weigend (*type coll.*): A, scale, dorsal view; B, scale, lateral view; C, staminodium, lateral view; D, petal, lateral view; E, sepal, dorsal view; F, habit. Scale bars A–E 0.5 cm, F 5 cm

Fig. 5: *Loasa roseoalba* Weigend (*Steyermark 52909*): A, scale, ventral view; B, scale dorsal view; C, petal, lateral view; D, staminodium dorsal view; E, staminodium, lateral view; F, sepal, dorsal view; G, habit; *Loasa humboldtiana* Urb. & Gilg (*type coll.*): H, staminodium, lateral view; I, scale, dorsal view (all scales and staminodia drawn at same magnification). Scale bars: A–F, H, I 0.5 cm, G 5 cm.

Fig. 6: *Loasa ramirezii* Weigend (cult. at Munich Bot. Garden): A, flower, dorsal view; B, staminodium, lateral view; C, scale, dorsal view, with two stamnodia enclosed; D, scale, lateral view; E, petal, lateral view; F, sepal; G, habit. Scale bars A 1 cm, B–F 0.5 cm, G 5 cm.

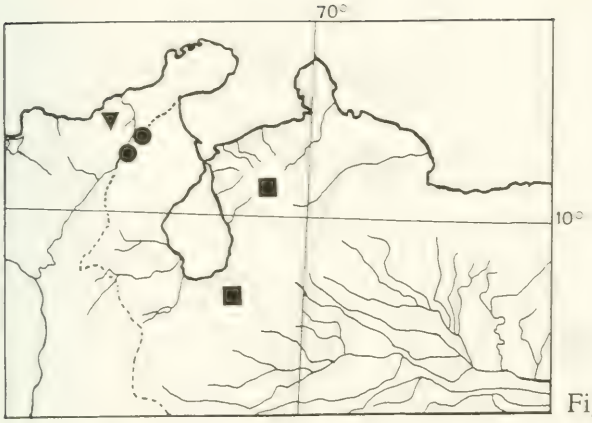

Fig. 9

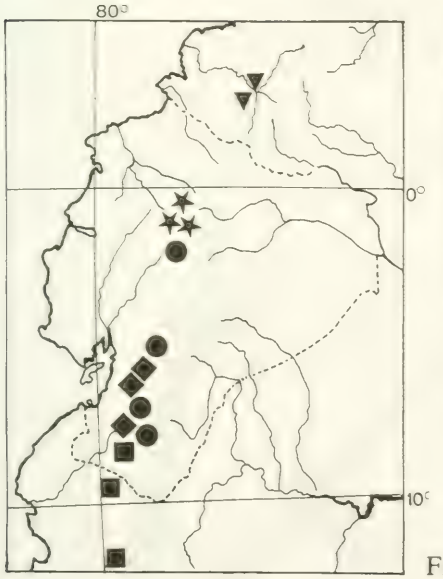

Fig. 8

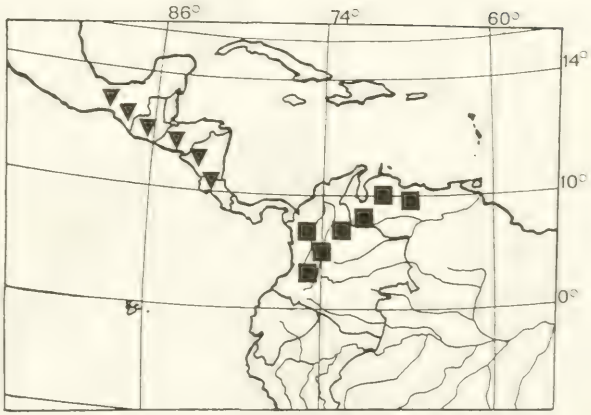

Fig.7

Fig.7: Distribution map for central and northern south America: ▼ *Loasa triphylla* Juss. subsp. *rudis* (Benth.) Weigend; ■ *Loasa triphylla* Juss. subsp. *papaverifolia* (Humb., Bonpl. & Kunth) Weigend.
Fig. 8: Distribution map for Ecuador and adjacent areas: ★ *Loasa aequatoriana* (Urb. & Gilg) Weigend, ◆ *Loasa roseoalba* Weigend,: ▼ *Loasa ramirezii* Weigend, ■ *Loasa bicornuta*Weigend, ● *Loasa triphylla* Juss. subsp. *triphylla*.
Fig. 9: Distribution map: ■ *Loasa venezuelensis* (Steyerm.) Weigend, ▼ *Loasa santamartae* Weigend, ● *Loasa perijensis* Weigend.

Fig. 10: *Loasa perijensis* Weigend (*type coll.*): A, scale lateral view; B, scale, dorsal view; C, staminodium lateral view; D, petal; E, sepal; F, inflorescence. Scale bars: A–C 0.5 cm, D,E 5 cm, F 5 cm.

Fig. 11: *Loasa perijensis* Weigend (*type coll.*): A, leaf from basal portion of plant; B, leaf from below inflorescence. Scale bars: A, B 5 cm.

Fig. 12: *Loasa santa-martae* Weigend (*type coll.*): A, scale,dorsal view; B, scale lateral view; C, staminodium, lateral view; D, inflorescence; *Loasa venezuelensis* (Steyerm.) Weigend (*type coll.*): E, staminodium; F, scale, dorsal view; G, sepal; H, petal. Scale bars A, B, C, E, F, 0.5 cm, D 5 cm, G, H 1 cm.

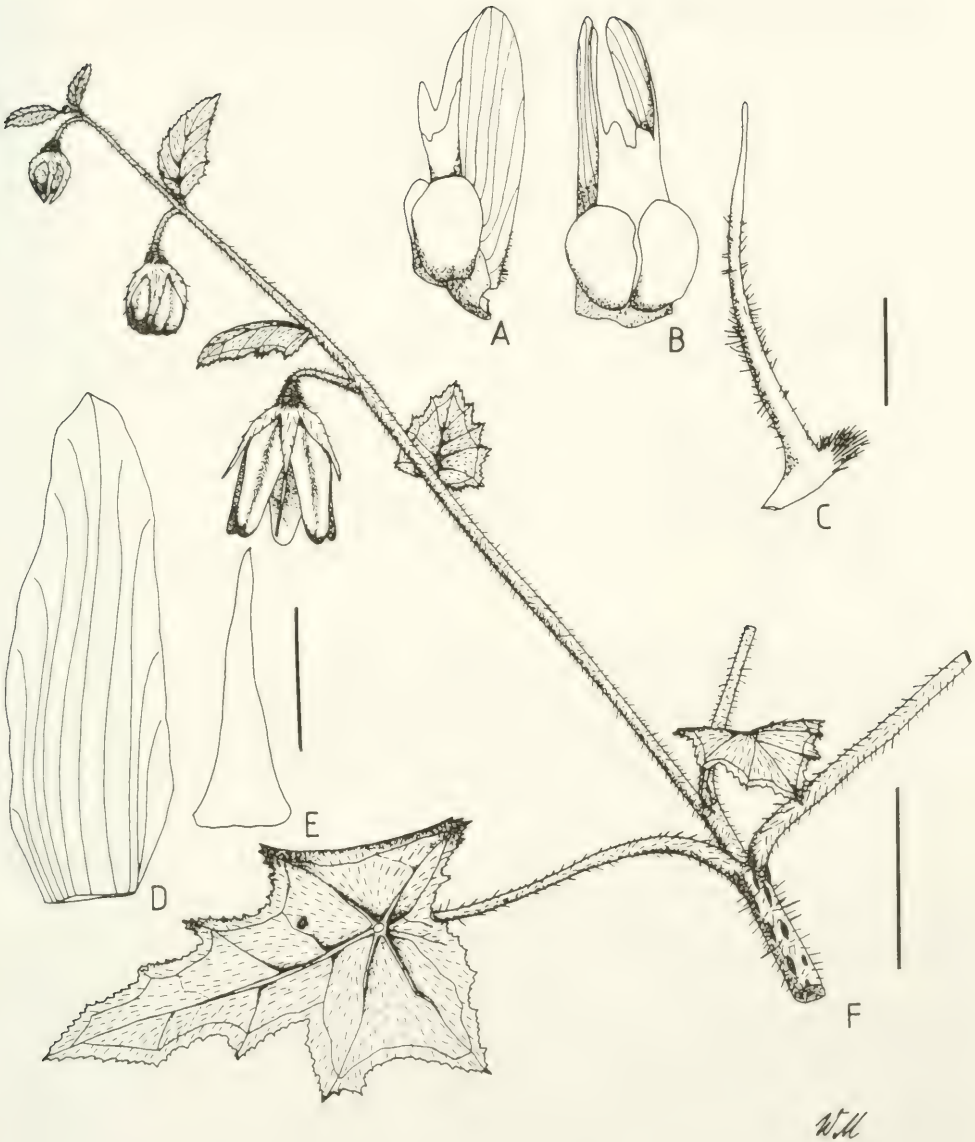

Fig.13: *Loasa peltiphylla* Weigend (type coll.): A, scale, lateral view; B, scale, dorsal view; C, staminodium, lateral view; D, petal; E, sepal; F, part of an inflorescence. Scale bars A–C 0.5 cm, D,E 1 cm, F 5 cm.

Taxonomic Revision of Astragalus L. sect. Hymenostegis Bunge (Leguminosae)

S. ZARRE M. & D. PODLECH

Abstract:
ZARRE M., S. & PODLECH, D.: Taxonomic revision of Astragalus L. sect. Hymenostegis Bunge (Leguminosae). – Sendtnera 3: 255–312. 1996. – ISSN 0944–0178.

The present work comprises the revision of *Astragalus* L. sect. *Hymenostegis* Bunge. 22 species are recognized. Detailed descriptions, complete lists of synonyms and distribution maps are given for all taxa. One species and one subspecies are newly described. The sect. *Hymenocoleus* Bunge is reduced to the rank of subsection. Differences between the section and the closely related sections are discussed.

Zusammenfassung:
Eine Revision von *Astragalus* L. sect. *Hymenostegis* wird vorgelegt. Ausführliche Beschreibungen, vollständige Synonymie und Verbreitungskarten aller Sippen werden angegeben, eine Art und eine Unterart neu beschrieben. Die Sektion *Hymenocoleus* wird als Subsektion von *Hymenostegis* geführt, die Unterschiede zu verwandten Sektionen diskutiert.

Introduction

Astragalus sect. *Hymenostegis* was placed by BUNGE (1868/69) in the artificial subgen. *Calycophysa*, together with its closest relatives, i.e. sect. *Megalocystis* Bunge, which was reviewed recently, see TIETZ & ZARRE (1994) and sect. *Acidodes* Bunge, for which no modern revision is available.

The entire section was revised by RECHINGER et al. (1958) and later for certain areas e.g. the flora of Turkey (CHAMBERLAIN & MATTHEWS 1970), the flora of URSS (GONTSCHAROV 1946) and flora of Iraq (TOWNSEND & GUEST 1974). However, because of the great variability in many species of the section, none of the available keys are useful for naming the species. The extensive variability present caused the taxonomists to describe a lot of new species in this relatively small section. The goal of this work was to provide an exact taxonomic definition for each taxon in the section, to recognize the limits of morphological diversity for each taxon and to prepare an useful diagnostic key for all taxa.

The present work is mainly based on the study of herbarium material kindly provided by the following herbaria (abbreviated according HOLMGREN et al. 1990): B, BG, BRNM, C, E, G, G-BOIS, JE, K, L, M, MSB, P, PR, TARI, TUH, W, WU and ZT.

Some additional field studies were carried out during an excursion to Iran (by S. ZARRE).

We want to thank the directors of the above mentioned herbaria for sending the material. We are grateful to Mr. CHEHREGANI from Bou-Ali University of Hamadan (Iran) for his support, especially in organizing the excursion in Iran. This work is partly supported by the Ministry of Culture and Higher Education of Islamic Republic Iran.

Position of the sect. *Hymenostegis* within the genus

Within the subgen. *Astragalus* sect. *Hymenostegis* belongs to the group of thorny Astragali (with exception of *A. vaginans*, whose leaves are imparipinnate) with a calyx inflated in fruit and unilocular fruits, which remain enclosed by the calyx up to maturity. The most conspicuous characters of the section are the ± large bracts and panduriform standards. Since some species of the closely related and very heterogeneous sect. *Megalocystis* have similarly ± large bracts and panduriform standard, there are some difficulties in separating the sections. However, the flowers in sect. *Megalocystis* are pedicellate in opposite to sect. *Hymenostegis* with sessile flowers. Moreover most of the species with such a standard in the former section have black hairs beside the white ones on the calyx, but in sect. *Hymenostegis* black hairs are always absent. For an exact view on the limits between these two sections see the diagnostic key.

Diagnostic key to the closely related sections

1 Short lateral shoots usually present at the base of each leaf on the main stem; inflorescences born on the short lateral shoots, only in *A. pachyrhachis* short lateral shoots sometimes not clearly developed sect. ***Poterion***

– Short lateral shoots absent; inflorescences arising from the main stem 2

2 Standard at least 15 mm long, if shorter, then the limb hastate or auriculate at base 3

– Standard up to 13(–14) mm long, limb rounded or somewhat angulately passing into the claw 5

3 Limb of standard rounded at the base sect. ***Megalocystis***

– Limb of standard hastate-auriculate at base 4

4 Flowers pedicellate; black hairs on inflorescence present, if absent (in *A. ebenoides* and *A. szovitsii*), then fruit laterally compressed and two bracteoles on the base of each calyx present sect. ***Megalocystis***

– Flowers sessile; black hairs absent; fruit dorsi-ventrally compressed; bracteoles absent or rarely present at the base of some calyces and mostly not in pairs sect. ***Hymenostegis***

5 Fruiting calyx only slightly larger than flowering one, ± campanulate to globose, not rupturing, 3–4,5 mm wide, the tube 3–5 mm long, only in *A. argyrostachyus* clearly enlarging, 6–9 mm wide, campanulate; calyx teeth as long as tube to distinctly longer than it; longer hairs on the calyx 2–4 mm sect. ***Campylanthus***

– Fruiting calyx bladdery inflated, contracted at the teeth, only in *A. diopogon* rarely rupturing, (4)5–10 mm wide, the tube 5–15 mm long; calyx teeth distinctly shorter than the tube; calyx hairs up to 2 mm long 6

6 Inflorescence longer than the leaves, if shorter, then densely flowered; fruit laterally compressed sect. ***Microphysa***

– Inflorescence shorter than or as long as the leaves, remotely few-flowered (with 2–6, rarely up to 13 flowers); fruit dorsi-ventrally compressed
sect. ***Megalocystis*** (*A. diopogon* and *A. eriostomus*)

Valuation of taxonomic characters

Many characters, which are normally important for the delimitation of neighboring sections, are not significant in sect. *Hymenostegis*, either because of homogeneity of the section, or because they are influenced strongly by ecological conditions. Relatively short flowering and fruiting period is another problem in naming the species. Our key is primarily useful when the flowers are still adherent to the inflorescence. Importance, variability and applicability of the characters are subsequently discussed:

Life forms, branching mode and habit: Except for *A. vaginans*, all species of the section are thorny cushions-forming subshrubs of alpine habitats. All are arising from a woody underground caudex. The stems are mostly branched from the base. In response to different ecological conditions the branching pattern can vary from remote to dense, even in the same species. Therefore none of these characters are of taxonomical importance.
Indument: The hairs are basifix (stable character of the subgen. *Astragalus*) and mostly pure white. *A. recognitus* and *A. hymenocystis* subsp. *hymenocystis* are the only taxa of the section with brownish-yellow hairs. Length of the hairs (especially on the calyx), their density and form are often very important characters.
Stem: Only *A. vaginans* has a stem with relatively long internodes, which is almost glabrous. Other species have stems with long internodes, which are hairy but become glabrescent later on.
Stipules: They have mostly the same texture as the bracts and can be useful for separating the species. Stipules are in many species long adnate to the petioles and otherwise connate. They become mostly glabrescent. The shape shows little variability and is therefore of no taxonomic value. The size of the stipules is very important and makes some species easily separable. In some species such as *A. chrysostachys* venation of the stipules shows only one main nerve at free portion, but the number of the nerves may increase under different ecological conditions. Because of this variability in some species, the stipule venation is of no taxonomic importance.
Leaves: As mentioned above with the exception of *A. vaginans* all species of the section possess paripinnate leaves. In some species the length of the leaves is very variable, but in some cases it can be used as a distinctive character. This is also true for the orientation of the rachides: In some species such as *A. persicus* both forms of rachides, straight and recurved, can be seen. The relative length petiole to the whole rachid is more or less equal in all of the species. End-thorn in subsect. *Hymenostegis* is mostly shorter than the uppermost leaflets, with some exceptions in *A. hirticalyx*. The number of leaflet-pairs is not very variable, and is of no taxonomical importance. *A. laguriformis* with 1–4 pairs of leaflets is the only species which can be characterized by this feature. Leaflet size, shape and indumentum are sometimes very good characters.
Inflorescence: Although some species show variability, the relative size of the inflorescence to the leaves is mostly of taxonomic significance. Its size and shape is important too. But in some withered specimens it is not easy to recognize, because the flowers fall off quickly. In this case the distance between flower traces can be used to determine whether the inflorescence is lax, which is very important for distinguishing some closely related species (for example *A. uraniolimneus* from *A. lagopodioides*).

The indumentum on peduncles is another important character. It can be villose or composed of straight, ± appressed hairs.
Bracts: Texture, size, tip, indumentum and colour of the bracts are the most decisive characters in the section. Very thin and hyaline bracts characterize for example *A. chrysostachys*. Acutely tipped bracts of *A. kohrudicus* make it easily distinguishable from the related *A. glumaceus*. The bracts in most of the species are glabrous inside, but in some others such as *A. hymenostegis, A. lagopoides, A. persicus* (not always) and *A. tabrizianus* they are hairy inside, especially at tip. Moreover the venation of the bracts of *A. hymenostegis* differs in one aspect from that of other species: The ends of the nerves are connected reticulately instead of ending parallely. However, this charachter is not easy to observe.
Bracteoles: They are rarely developed in some species and of no taxonomic importance.
Pedicel: All the species have nearly sessile flowers.
Calyx: In spite of its very thin texture the calyx remains unruptured during its maturation in all species. With exceptions of *A. paralurges* and *A. sciureus* the calyx is bladdery inflated immediately after anthesis. The shape of calyx is at first tubular and after inflation globose or elliptic. Calyx is parallely nerved, and the number of the nerves changes in a narrow range. The calyx indumentum and form of the teeth are almost constant in all species. However the size of the calyx, colour of the nerves and proportion of the tooth length to the tube are sometimes distinguishing characters.
Corolla: Almost all species have standards with yellowish white claws. But the limb colour is a good character to distinguish for example *A. chrysostachys* and *A. recognitus* from other closely related species. They have always yellowish white limbs, whereas other species may have pink, red, purple or violet limbs. As the colour of the corolla after collecting changes determination of the colour is sometimes very difficult. In most species the claws of the wings and keel may be adnate up to 1 mm to the staminal tube, but in *A. sciureus* they are nearly free. This character is difficult to measure and the differences are not large enough to be of use in the key.
Standard: the standard is homogeneously panduriform in the whole section. But its size and the proportion of limb to claw is sometimes taxonomically useful.
Wings: The size of the limbs is their most important character. Some species, such as *A. hymenocystis, A. nervistipulus, A. strausii* and *A. uraniolimneus* have wings with a conspicuously large limb, although there are usually no sharp limits between species with respect to this character. In the isolated *A.glumaceous* group the auricles of the wings are larger than in other species of the section.
Keel: It is always distinctly shorter than the wings. The limb size is a very good character to separate the *A.glumaceous* group from other species of the section. Furthermore the limb outline is because of the variability in some taxa of no taxonomical importance. The auricle is tiny in all species.
Stamens and ovary: Except for the length of the segment, where the stamens are free from each other, none of the characters of these two organs are taxonomically important.
Fruit: Their characters are of limited use in the key: Most of the herbarium specimens are without ripe fruits, because as soon as they are ripe, flowers with fruits fall off in many species, and the specimens in this state have nearly no value for collecting. The fruits are always dorsi-ventrally compressed. Their form and indumentum do not provide distinctive characters, as they are very homogenous in the whole section. However the size of them may be used for separating two closely related species *A. chrysostachys* and *A. recognitus*.
Seeds: None of their characters are used here, firstly because they are mostly not ripe on herbarium sheets, and secondly the section is very homogeneous in their characters.

Grouping in the section

The section is divided in two subsections in this work: subsect. *Hymenocoleus* and subsect. *Hymenostegis*. The former differs from the latter mainly in having imparipinnate leaves. But the structure of inflorescence and flowers in both subsections is identical. Therefore we have preferred to reduce the monotypic sect. *Hymenocoleus* to the rank of a subsection.

Subsect. *Hymenostegis* is very homogeneous and can be scarcely grouped into natural units. In respect to similarity in some important characters we have recognized the following groups in the subsection. However there are no sharp morphological limits between the groups and the characters overlap in many cases. Therefore no formal rank is considered for the groups.

Group 1: *A. glumaceous* and *A. kohrudicus*: It is a somewhat isolated and easily determinable group within the subsection. It is characterized by very broad inflorescence, large bracts and flowers.
Group 2: *A. chehreganii* and *A. strausii*: Relatively broad inflorescence and ± large standards are the features, which connect this group with the preceding, but long peduncle and short hairs on the calyx make it easily separable from group 1.
Group 3: *A. chrysostachys, A. hirticalyx, A. hymenostegis, A. lagopoides, A. laguriformis, A.nervistipulus, A. pedicularifomis, A. persicus, A. recognitus, A. tabrizianus* and *A. velenovskyi*: This is the central group in the subsection. Most species are very variable, and some forms are so different from the typical form, that it is difficult to believe they belong to a same species, but mostly there is a continuous range of variability. Separating the species can be difficult because some of their more extreme morphs can approach neighboring species. For example short-pedunculated forms of *A. persicus* might be mistaken for *A. hirticalyx*, large bracteate forms of the former for *A. lagopoides* and so on. Because of this problem it was very difficult to prepare a diagnostic key for the group and for example *A. persicus* is cited many times in the key.
Group 4: *A. lagopodioides, A. paralurges, A. rubrostriatus* and *A. sciureus*: Lax inflorescences with remote flowers are the conspicuous characters of the group. Moreover, *A. paralurges* and *A. sciureus* have a calyx which becomes not distinctly inflated with age. *A. sciureus* possesses the longest inflorescence in the subsection. The group can not be differentiated exactly from group 3, because *A. sciureus* sometimes has a dense inflorescence like some forms of *A. persicus* with long cylindrical inflorescences. However, in *A. persicus* the calyx inflates itself soon after anthesis.
Group 5: *A. hymenocystis* and *A. uraniolimneus*: It is very near to the former group in nearly all respects but has dense inflorescences.

Geographical distribution and ecology

Almost all members of the sect. *Hymenostegis* are Irano-Turanian elements and are common in mountain regions of the Iranian highland (see map 1). Iran is the center of diversity of the section,with 17 species of which 11 are endemic in the region.Turkey with 7 species and 3 endemics, Azerbeidzhan and Armenia each with 3 species and Iraq with 2 species are other countries in which the section is native. The widest ranging species in the section are *A. chrysostachys, A. glumaceous* and *A. persicus*.

Local endemism plays a very important role in the section. Some of the species with such a distribution pattern are: *A. chehreganii* (from Guoushchi mountains N of Oroumieh lake, NW Iran), *A. hymenocystis* and *A. hymenostegis* (same area as the former), *A. pedicularifomis* (near Sultanieh in Prov. Zanjan, W Iran) and *A. laguri-*

formis (from Iraqish-Turkish border, Prov. Kordestan). It is of interest, that three of the local endemics can be found in the montain region next to the northern part of the Uroumieh lake. Apart from the species named above there are 7 more taxa of this section in the Prov. W Azarbaijan: *A. chrysostachys, A. glumaceous, A. hirticalyx, A. lagopoides, A. persicus, A. tabrizianus* and *A. uraniolimneus*.

The species of the sect. *Hymenostegis* prefer to live in higher areas between (400–) 800–3000 m. Most of them are cushion-forming plants of alpine habitats, which can be found in steppes with *Astracantha*, *Artemisia*, *Cousinia*, *Thymus* and others. Similar to other thorny *Astragali*, the species of the sect. *Hymenostegis* are adapted to dry and windy condition. Flowering and fruiting of the section occur in the months (May–)June–August.

Taxonomic enumeration

Astragalus L. sect. ***Hymenostegis*** Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 57. 1868. **Lectotype** (Podlech 1990): *A. hymenostegis* Bunge.

Plants perennial, mostly cushion forming dwarf shrublets, 10–60 cm in diameter, 10–70 cm high, densely or loosely branched from the base. Hairs basifix, white or yellow, 0.1–6 mm long, with a sharp tip, the longest ones mostly on peduncle and on the calyx, the longer ones mostly somewhat thicker as the remainder. Caudex light brown to grey or black, prostrate, 0.5–3 cm thick. Stems prostrate or ascending, up to 20 cm long, 1–5 mm in diameter, hairy or glabrous, below the stipules always densely hairy, glabrescent. Stipules membranaceous or chartaceous, yellow, with 1–13 parallel nerves in free portion arising from a loose reticulate net at the base, 8–30 mm long, up to lower half adnate to petiole, otherwise connate, free portions triangular-lanceolate, acute or acuminate, younger ones appressedly hairy, later on glabrescent, sometimes ciliate. Leaves 1–20 cm long; rachides remote or dense, thin or thick, mostly rigid, with appressed or spreading hairs; petiole 1/7–1/2 the length of the rachid; end-thorn mostly present 1/10–1/1(–3 times) the length of the uppermost leaflets; terminal leaflet only present in *A. vaginans*. Leaflets in 1–13 pairs, 3–30 mm long and 1–12 mm wide, flattened or complicate, narrowly oblong-elliptic to elliptic or oblong, rarely obovate, obtuse or acute, mostly mucronate, both sides densely or sparsely appressed hairy, rarely spreadingly hairy, sometimes glabrescent, rarely glabrous. Inflorescence shorter than or overtopping the leaves; flowering part 2–25 cm long and 2–4.5 cm wide, globose to long cylindrical, sometimes lax and spicate; peduncle 0.5–30 cm long, shorter or longer than the leaves, densely appressed hairy to villose. Bracts thinly membranaceous to glumaceous, yellow, sometimes purple at tip, 8–27 mm long and 2–12 mm wide, broadly ovate at the base of inflorescence to elliptic-lanceolate further up, acute or acuminate at tip, densely or sparsely appressed hairy on midrib and apex, becoming glabrous, sometimes glabrous from the beginning, ciliate, inside of the bracts mostly glabrous, sometimes hairy especially at tip. Bracteoles rarely present, 1 or 2, 4–7 mm long and 0.5–1.5 mm wide, linear or subulate, mostly villose. Flowers sessile. Calyx yellow, sometimes purple at tip, 10–28 mm long and 3–16 mm wide, at first tubular, mostly inflating after anthesis, with 15–30 parallel nerves, which anastomose towards the teeth, densely appressed pilose, hairs initially straight, then crispate, irregularly villose or tomentose; teeth 4–12 mm long, from a shortly triangular base subulate to filiform. Corolla with white or yellow claws, limbs the same colour as the claw, or pink to purple, sometimes blue to violet towards margins. Standard 13–31 mm long; limb panduriform, hastate at base; claw cuneate. Wings slightly shorter than the standard; limb oblong, obtuse; claw somewhat longer than limb. Keel distinctly shorter than wings; limbs 5–6 mm long and 2–3 mm deep, obovate-elliptic, triangular

or rarely oblong, obtuse or minutely mucronulate, minutely auriculate at base; claw longer than the limb. Stamens as long as the keel, at upper 2.5–5 mm free from each other. Ovary 2–8 ovulate, densely appressed hairy; style hairy up to lower half. Fruit dorsi-ventrally compressed, 4–11 mm long, narrowly elliptic to elliptic or rarely ovate, ventral side straight, dorsal side curved, valves slightly expanded, densely appressed pilose; beak 0.6–2.5 mm long, straight, mostly hooked at tip. Seeds always single, 3–4.5 mm long and 2–3 mm wide, elliptic-reniform.

Key to the subsections of *Astragalus* sect. *Hymenostegis*

1 Stems elongated, internodes 1–1.5 cm long; leaves remote, imparipinnate; leaflets glabrous on adaxial surface *A.* subsect. ***Hymenocoleus***
– Stems short, internodes up to 0.7 cm long; leaves dense, paripinnate; leaflets hairy on adaxial surface *A.* subsect. ***Hymenostegis***

Astragalus L. subsect. ***Hymenocoleus*** (Bunge) Podlech & Zarre, **comb. nov.**
≡ *Astragalus* L. sect. *Hymenocoleus* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 57. 1868. **Type** (monotypic): *Astragalus vaginans* DC.

Leaves imparipinnate. Otherwise see description of the species.

1. ***Astragalus vaginans*** DC., Astragal.: 210, t. 37. 1802 ≡ *Tragacantha vaginans* (DC.) Kuntze, Revis. Gen. 2: 949. 1891. **Lectotype** (here designated): 'A. orientalis flore ochroleuco' , *Tournefort* (P: Hb.VAILLANT!).

Figures: DE CANDOLLE, Astragalogia: tab. 37. 1802.

Plants c. 30 cm high, up to 40 cm including inflorescence. Hairs 0.1–2 mm, except those on calyx mostly straight, thick. Stems ascending, up to 23 cm long, growing 2–20 cm per year, in first year 2–3.5 mm in diameter, below stipules glabrous or sparsely pilose. Stipules thinly membranaceous, greenish to yellowish white, with 8–13 parallel nerves at free portion, 10–30 mm long, at a length of 4–15 mm adnate to the petiole, otherwise 2–14 mm connate, triangular-lanceolate, acuminate, glabrous or ciliate. Leaves imparipinnate, with 5–13 pairs of leaflets, 3–11 cm long; rachides remote, ± thin, flexible, straight or curved, obliquely erect or rarely deflexed, sparsely appressed hairy; petiole 1/7–1/5 the length of the rachid; terminal leaflet ± as long as the leaflets of the next pair; leaflets light green, remote or rarely dense, 10–27 mm long and 2–6 mm wide, flattened, narrowly elliptic to elliptic, acute, with a mucro up to 1 mm long, upper surface glabrous, lower surface sparsely appressed hairy. Inflorescence distinctly overtopping the leaves, dense, 3.5–5 cm long and c. 4 cm in diameter, globose to ovate; peduncle 10–15 cm long, longer than the leaves, densely covered with short and long appressed hairs, longer hairs thicker than the reaminder. Bracts chartaceous sometime hyaline at margins, yellowish white, younger ones purplish at tip, 12–17 mm long and 4–6 mm wide, ovate-elliptic, long acuminate, glabrous, ciliate, rarely sparsely appressed pilose on midrib. Calyx yellowish white with purple teeth, 13–17 mm long and 4–6 mm wide, at first tubular later on slightly elliptically inflating, with 22–30 parallel nerves, densely long appressed hairy becoming ±densely tomentose; teeth 4–6 mm long. Corolla limb purple; claws of wings and keel at the base adnate to the staminal tube. Standard 18–22 mm long; limb 12–14 mm long and 6–8.5 mm wide, elliptic or oblong-panduriform, rounded or shallowly retuse at the apex, obtusely

hastate-auriculate at base; claw 5–8 mm long. Wings 17.5–21 mm long; limbs 8.5–9.2 mm long and 2.5–3 mm wide, oblong, obtuse or rarely minutely mucronulate at tip; auricle 0.2–0.4 mm long; claw 9–12 mm long. Keel 15.5–17 mm long; limbs ca. 6 mm long and 3 mm deep, obovate-elliptic, with broadly curved lower edge and ± straight upper edge, obtuse, rarely minutely mucronulate; claw 9.5–11 mm long. Stamens at the upper 3 mm free from each other. Fruit immature. Seeds immature.
Flowering and fruiting time: VI–VII(–VIII).
Occurence: Loose forests (for example of *Pinus brutia*), mostly in somewhat humid climat.
Distribution: Turkey (Anatolia). Map 10.

Specimens seen:

Turkey. Prov. Adana: Amanus-Gebirge (Nur daglari), ca. 3 km S oberhalb Yarpuz (29 km E Osmaniye), 1200 m, 13.7.1978, *Ehrendofer et al. 787-38* (MSB) – Cappadocia, Hadjin, Kala Sekisi, 27.6.1893, *Förster 912* (M). – Prov. Maras: 78 km N Maras, zwischen Maras und Göksun, 1280 m, 7.7.1981, *Nydegger 16713* (M, MSB) – Maras-Göksun, 60 km S Göksun, 540 m, 1.6.1987, *Nydegger 42588* (MSB) – Bulghar Maaden, Al Chodscha, 1300 m, 1896, *Siehe 594* (P).

A. vaginans is the only species of the subsect. *Hymenocoleus*. Except for imparipinnate leaves and long internodes there is no difference between the two subsections. Here is the same situation as between sect. *Anthylloidei* DC. and sect. *Megalocystis* Bunge. As it was mentioned (TIETZ & ZARRE 1994), the end thorn can be absent in some forms of the species of sect. *Megalocyctis*, namely *A. ebenoides* and *A. raddei*, thus this character is bad to use for separating two sections.

Within the sect. *Hymenostegis A. vaginans* is comparable with *A.chehregani* and *A. strausii*, because of the very dense and globose to shortly cylindrical inflorescence and the short hairs on the calyx.

In hb. DECANDOLLE (G-DC) there is no original material of *A. vaginans*, therefore the specimen of hb. VAILLANT in Paris, which surely has been seen by DE CANDOLLE, is selected as lectotype.

Astragalus L. sect. *Hymenostegis* Bunge subsect. *Hymenostegis*

Leaves always paripinnate. Otherwise see description of the section.

Key to the species and subspecies of subsect. *Hymenostegis*

1 Inflorescence lax, the axis visible, if not clearly visible (some forms of *A. sciureus*), then 13–27 cm long 2
– Inflorescence dense, globose to long cylindrical, the axis not visible, shorter 5
2 Stipules 17–27 mm long; median leaves 10–16 cm long ***A. sciureus***
– Stipules 6–15 mm long; median leaves up to 8(–10) cm long 3
3 Rachides spreadingly hairy; peduncle villose ***A. lagopodioides***
– Rachides appressedly hairy; peduncle appressedly hairy or longer hairs rarely subappressed to ± patent 4
4 Median leaves 3–8(–10) cm long; rachides obliquely erect to patent; calyx at anthesis campanulate-tubular, immediately after anthesis inflated, 5–8 mm wide, elliptic-cylindrical ***A. rubrostriatus***

– Median leaves 2–3.5 cm long; rachides mostly deflexed; calyx at anthesis tubular, after anthesis not or slightly inflated, 3–4 mm wide, tubular to narrowly elliptic ***A. paralurges***

5 Keel 19–26 mm long, the limbs 7–10 mm long, 3.5–4 mm wide 6

– Keel 11–20 mm long, the limbs 4–6.5 mm long and 2.5–3.5 mm wide 7

6 Leaflets 0.5–3 mm wide, linear to narrowly oblong-elliptic, ± folded; bracts acute or shortly acuminate ***A. kohrudicus***

– Leaflets 3–12 mm wide, elliptic to broadly elliptic, flattened; bracts longly acuminate ***A. glumaceus***

7 Bracts thinly membranaceous, hyaline, never purple at tip, glabrous or only ciliate at the margins; calyx teeth and nerves of same colour as tube; corolla limb sulphureous or pale yellow ***A. chrysostachys***

– Bracts thickly membranaceous to glumaceous, sometimes purple at tip, if thinly membranaceous and hyaline at margins then calyx teeth and nerves red to purple, bracts densely pubescent or hairy only on the midrib; corolla limb pink, purple, violet, yellow to white 8

8 Inflorescence shorter than or as long as the leaves [1] 9

– Inflorescence distinctly overtopping the leaves 14

9 Leaflets in 1–3(–4) pairs ***A. laguriformis***

– Leaflets in (3–)4–10 pairs 10

10 Corolla limb pale yellow ***A. velenovskyi***

– Corolla limb pink to purple 11

11 Bracts longer than or as long as the calyx, lower ones 13–20 mm long 12

– Bracts distinctly shorter than the calyx, lower ones 9–11(13) mm long 13

12 Bracts densely pubescent or hairy at least on midrib and apex; stipules chartaceous, not hyaline; leaflets densely appressed hairy, silvery green ***A. tabrizianus***

– Bracts glabrous; stipules membranaceous, hyaline; leaflets sparsely appressed hairy, becoming glabrous, green ***A. pedicularifórmis***

13 Peduncle covered with short subappressed hairs, long hairs up to 2 mm long ***A. persicus***

– Peduncle villose, long hairs 2–3.5 mm long ***A. hirticalyx***

14 Bracts longer than or as long as the calyx, persistent in fruit 15

– Bracts shorter than the calyx, caducous, rarely persistent 17

15 Leaflets densely to sparsely spreadingly hairy; young rachides patent hairy ***A. persicus***

– Leaflets densely appressed hairy; young rachides ± appressedly hairy 16

16 Bracts very broad, lower ones 7–12 mm wide, inside hairy at apex, shortly or rarely long acuminate, acumen shorter than half of the limb, if longer, then purple tipped ***A. hymenostegis***

– Bracts narrower, lower ones 5–8 mm wide, inside glabrous at the apex, long aristate, arista more than half as long as limb, the apex mostly the same colour as the limb ***A. lagopoides***

17 Calyx 16–23 mm long, the hairs up to 6 mm long; wings 18–22 mm long, their limbs 8–12 mm long; inflorescence at least 2-times longer as wide ***A. nervistipulus***

– Calyx 12–18 mm long, the hairs up to 4.5 mm long; wings 14–18 mm long, if wings longer, then inflorescence globose or up to 1.5-times longer as wide 18

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1) In younger forms of *A. uraniolimneus* inflorescences sometimes are shorter than the leaves. This specimens can be determined from *A. hirticalyx* by their thin, hyaline and flexible stipules.

18 Corolla limb white or yellow [2] 19
– Corolla limb pink to purple or violet 21
19 Calyx nerves distinctly red to purple *A. persicus*
– Calyx nerves whitish yellow, without any contrast with the rest of tube 20
20 Hairs mostly brownish yellow; leaflets with double indumentum, i.e. densely hairy with long, subappressed straight hairs and under them shortly tomentose; pods 8–10 mm long *A. recognitus*
– Hairs pure white; leaflets simply sericeous or spreadingly hairy; pods 6–7 mm long *A. persicus*
21 Median leaves up to 5 cm long 22
– Median leaves 6–16 cm long 24
22 Standard limb ± as long as the claw or slightly longer *A. persicus*
– Standard limb 1.7–3 times longer than the claw 23
23 Rachides straight, thick, rigid, obliquely erect to subhorizontal, older ones not broken *A. uraniolimneus*
– Rachides recurved, thin, flexible, older ones mostly broken *A. hymenocystis*
a Leaflets covered with yellow hairs, thick, elliptic to broadly elliptic or obovate, obtuse at tip *A. hymenocystis* subsp. *hymenocystis*
b Leaflets white hairy, thin, narrowly oblong-elliptic, rarely narrowly obovate, mostly acute at tip *A. hymenocystis* subsp. *confiniorum*
24 Inflorescence 2–3 cm wide, ovate to long cylindrical; standard 13–22 mm long, the limb up to 1.5 times longer than the claw; bracts pubescent or glabrous *A. persicus*
– Inflorescence 3–4.5 cm wide, globose to ovate; standard 18–27 mm long, the limb 2–3 times as long as the claw; bracts glabrous or only ciliate at margins 25
25 Peduncle patent hairy; standard 20–27 mm long; wing limb 8–11 mm long; leaflets 7–30 mm long, linear to narrowly oblong *A. straussii*
– Peduncle appressedly hairy; standard 18–21 mm long; wing limb 7–8(–9) mm long; leaflets 6–18 mm long, narrowly elliptic *A. chehreganii*

2. *Astragalus chehreganii* Zarre & Podlech **sp. nov.**
Holotype: Persia, Prov. W Azarbaijan, in jugo Qushchi inter Shahpur et Rezaiyeh, 1600–1850 m, 13.6.1971, *Rechinger 41877* (W!; Iso: MSB!).

Fig. 2a

Differt ab *A. straussii* foliolis brevioribus et latioribus, pedunculo appresse (nec patenter) piloso, vexillo 18–21 (nec 20–27) mm longo et lamina alarum 7–8 (nec 8–11) mm longo.

Plantae suffruticosae, ad 40 cm altae. Caules saepe ascendentes, ad 22 cm longi, parte hornotino 1–1,5 cm longo. Stipulae firme membranaceae, flavidae, 12–17 mm longis, per 6–10 mm petiolo adnatae, acuminatae, glabrae vel margine ciliatae. Folia 2,3–11,5 cm longae, rachidibus primo flexilibus demum rigidis validis, oblique erectis ad patentibus, dense sericeis, demum glabrescentis, petiolo laminae attingente, spina terminali 1/4–1/2 longitudinis foliolorum apicalium attingente. Foliola (3–)5–11 juga, remota, 7–20 mm longa et 1,5–4 mm lata, linearia ad anguste elliptica, acuta, mucrone terminali ad 2 mm longo, plana, utrimque dense vel sparse sericea. Inflorescntia dense

2) *A. chehreganii* has a corolla which sometimes seems yellow, but with exact observation it will be clear that they are tinged with red or pink, and through drying the colour was changed. The globose inflorescence of the latter can be used as another diagnostic character for distinguishing it from yellow-flowered species of the section.

globosa, 3–4 cm diametro, pedunculo 10–21 cm longo, dense appresse piloso suffulta. Bracteae firme membranaceae, flavidae, 7–10 mm longae, ovatae ad oblongi-ellipticae, acuminatae, glabrae vel basi ciliatae. Calyx lacteus dentibus purpureis, campanulati-tubulosus, demum leviter inflatus, 13–16 mm longus et 5–8 mm latus, dense villosus, dentibus 5–7 mm longis. Corollae laminae roseae vel rubrae. Vexillum 16–21 mm longum, lamina 12–15 mm longa et 5–9 mm lata, basi hastati-auriculata, ungue 4–6 mm longo. Alae 15–19 mm longae; auricula 0,2–0,4 mm longa. Carina 14–16 mm longa. Fructus immaturus.

Plants 20–30 cm high, up to 40 cm including inflorescence. Hairs 0.1–1 mm, on peduncles up to 2(–2.5), on the calyx up to 3.5 mm long, mostly strongly appressed. Stems mostly ascending, up to 22 cm long, growing 1.5–5 cm per year, in first year 1–2.5 mm in diameter. Stipules thickly membranaceous, not hyaline, rigid, yellow, with 3–8 parallel nerves in the free portion, 12–17 mm long, at a length of 6–10 mm adnate to the petiole, otherwise 3–6 mm connate, from a narrow triangular base lanceolate, acuminate, glabrous or at margins ciliate. Leaves 2.3–11.5 cm long; rachides ± remote, rigid and thick, younger ones flexible, straight or curved, obliquely erect to horizontal or rarely deflexed, densely sericeous, later on becoming glabrous; petiole c.1/3 the length of the rachid; end-thorn 1/4–1/2 of the length of the uppermost leaflets; leaflets in (3–)5–11 pairs, ± remote, light to yellowish green, 7–20 mm long and 1.5–4 mm wide, mostly flattened, linear to narrowly oblong-elliptic, acute, with a mucro up to 2 mm long, both sides densely to sparsely sericeous. Inflorescence much higher as the leaves; flowering part 3–4 cm in diameter, densely globose or slightly wider as high; peduncle 10–21 cm long, longer than the leaves, densely covered with appressed hairs. Bracts thickly membranaceous, with hayline margins, yellowish, 7–10 mm long and 3–6 mm wide, ovate to elliptic-oblong, acuminate, glabrous or only at the base ciliate. Calyx creamy with purple teeth, tubular-campanulate, slightly inflating after anthesis, 13–16 mm long and 5–8 mm wide, with 15–25 parallel nerves, ± densely villose; teeth 5–7 mm long. Corolla pink to red, the claws pale yellow, the claws of the wings and the keel up to 2 mm adnate to the staminal tube. Standard 16–21 mm long; limb 12–15 mm long and 5–9 mm wide, oblong-panduriform, emarginate or rarely rounded at the apex, sharply or obtusely hastate-auriculate at base; claw 4–6 mm long, cuneate. Wings 15–19 mm long; limb 7.3–9 mm long and 2.5–3.7 mm wide, narrowly oblong to oblong, obtuse, rarely minutely mucronulate at tip; auricle 0.2–0.4 mm long; claw 8–10.5 mm long, 1.1–1.5 times as long as the limb. Keel 14–16 mm long; limbs 5–6 mm long and ca. 3 mm deep, obovate-triangular or -elliptic, lower edge ± right-angled, upper edge convex, obtuse or minutely mucronulate at tip; auricle small; claw 9–11 mm long. Stamens at upper 4–5 mm free from each other. Fruit immature. Seeds immature.
Flowering and fruiting time: (V–)VI–VIII.
Occurence: Dry mountainous steppes; 1500–1700 m.
Distribution: NW Iran: Around Uroumieh. Map 2.

Specimens seen:

Iran. Prov. W Azarbaijan: Shahpour to Rezaieh, Ghoushchi pass, 22.6.1961, *Sharif 40923* (W) – Maragheh, Ghoushchi pass, 27.6.1965, *Arghand 6721* (W) – Pass SE Shahpur, 1750 m, 6.7.1968, *Petrovitz 81* (W) – Rezaieh, Goushchi pass, 1690–1820 m, 20.6.1970, *Termeh 14658* (W) – Shahpur to Rezaieh, Goushchi, 13.6.1971, *Iranshahr 14751* (W) – In declivibus borealibus jugi Qushchi inter Shahpur et Rezaieh, 1700 m, 21.7.1974, *Rechinger 49808* (W) – dito, 1600–1850 m, 13.6.1971, *Rechinger 41877* (MSB!, W!).

The species is very closely related to *A.strausii*, which occurs on the mountainous slopes located in northern centeral Iran. In addition to geographical differentiation, the new species differs in many morphological aspects from *A. strausii*: The leaflets are shorter and broader, standard is somewhat shorter, the peduncle is appressedly hairy (in *A. strausii* it is villose). Moreover, the peduncle of *A. strausii* is distinctly thicker than that of *A. chehreganii*. Limb of the corolla is pink to red in *A. chehreganii*, but sometimes they become yellow during drying but then their margins remain tinged with red. The species is named in honour of Mr. A. Chehregani, the plant biologist of the Bou-Ali University of Hamadan.

3. ***Astragalus chrysostachys*** Boiss., Diagn. Pl. Or. Nov. 2: 69. 1843 ≡ *Tragacantha chrysostachys* (Boiss.) Kuntze, Revis. Gen. 2: 944. 1891. Syntypes: Persia, *Aucher 1272* (G!); prope Ispahan, *Aucher 4401*; in Prov. Aderbidjan, *Aucher 4401A* (G!, G-BOIS!, LE!, P!, W!); et *4403* (W!). **Lectotype** (here designated): prope Ispahan, *Aucher 4401* (G-BOIS!; Iso: G!, LE!, P!, W!).
= *A. melanostictus* Freyn, Bull. Herb. Boiss. 5: 603. 1897. Holotype: Persia occ., Prov. Irakadjmi, Sultanabad ad Mowdere, 26.5.1894 [1892], *Strauss* (BRNM!; Iso: B!, W!)
= *A. chrysostachys* var. *villosus* Bornm., Beih. Bot. Centralbl. 19(2): 233. 1906. Syntypes: Sultanabad, ad Mowdere, 5.4.1889; 8.6.1890; 16.5.1892 (B!); et 26.5.1892, alle *Strauss* (B!, W!); in monte Schahsinde, VI.1897, *Strauss* (B!: foto MSB!, G!); in monte Raswend, V.1896; VII.1897, alle *Strauss* (B!); prope Burudschird, VI.1898, *Strauss*. Lectotype (here designated): prope Brudschird, VI.1898, *Strauss* (B!).
= *A. chrysostachys* Boiss. var. *parisiensis* Sirj. & Rech.f., Anz. Österr. Akad. Wiss., Math.-Naturwiss. Kl. 1953: 184. 1953 ≡ *A.chrysostachys* Boiss. f. *parisiensis* (Sirj.& Rech.f.) Parsa, Fl. Iran 9: 91. 1966. Holotype: Lorestan, Mte. Paris, [7000 ft, 28.5.1940] *Koelz 15880* (W!).
= *A.chrysostachys* var. *khorassanicus* Sirj. & Rech.f., Anz. Österr. Akad. Wiss., Math.-Naturwiss. Kl. 1953: 156. 1953. Holotype: Montes Kopet-Dagh, inter Kuchan et jugum Alamli, 1600 m, 3.6.1948, *Rechinger & Aellen 4802* (W!: foto MSB!; Iso: B!, G!, MSB!)
= *A. chrysostachys* var. *kopetdaghensis* Sirj. & Rech.f., Repert. Spec. Nov. Regni Veg. 48: 48. 1940. Holotype: Khorasan, Kopet-Dagh, zwischen Kuchan und Lutfabad, Paß Alamli, 2000 m, 14.7.1937, *Rechinger 1655* (W!; Iso: BM!, G-AELLEN!)
= *A.chrysostachys* var. *sericeus* Bornm., Beih. Bot. Centralbl. 19(2): 233. 1906. Syntypes: inter Sultanabad et Kum, Latedar, 10.6.1895, *Strauss*; ibidem, Kuh-Tefresch, VI.1897, *Strauss* (B!: foto MSB!). Lectotype (here designated): inter Sultanabad et Kum, Latedar, 10.6.1895, *Strauss* (B!: foto MSB!).
= *A. sosnowskyi* Grossh., Fl. Kavkaza 2: 299. 1930., in clave, rossice et in Trudy Tbilissk. Bot. Inst. 12: 236. 1948, descr. emend. (latine). Type: Turkey, distr. Olty, prope p. Karnawaz, 7.7.1911, *Sosnovsky* (Iso: B!: foto MSB!).

Fig. 4a

Plants 10–25 cm high, up to 40 cm including inflorescence. Hairs 0.1–1 mm, on peduncle up to 2 mm, on calyx up to 4.5 mm long. Stems 1.5–15 cm long, ascending to prostrate, growing 1–5 cm per year, in first year 2–3 mm in diameter. Stipules whitish or yellow, thinly membranaceous, hyaline, fragile, mostly wrinkled, older ones often folding downwards, with 1–8 parallel nerves in upper part, at tip mostly only with one obvious nerve, 7–22 mm long, at a length of 5–10 mm adnate to the petiole, otherwise 1–4 mm connate, triangular-lanceolate, acute or acuminate, glabrous,

sometimes ciliate at margins. Leave 1–11 cm long; rachides dense, obliquely erect, straight or recurved or rarely deflexed, ± thick and rigid, densely covered with short appressed or spreading hairs; petiole 1/4–1/3(–1/2) the length of rachid; end-thorn 1/5–1/2 the length of the uppermost leaflets; leaflets in 4–10 pairs, remote or ± dense, whitish green to dark green, ± flattened, 5–25 mm long and (1.5) 2–6(–7) mm wide, narrowly oblong-elliptic to elliptic or rarely broadly elliptic, acute or obtuse, with a mucro up to 2.5 mm long, both sides densely appressed sericeous or with spreading hairs. Inflorescence dense, younger ones ovate, becoming cylindrical, 3–10 cm long and 2–3.5 cm wide; peduncle often longer than the leaves, 3–20 cm long, densely covered with short appressed to spreading hairs up to 1 mm long, and between them some appressed to subappressed straight thick hairs up to 2 mm long. Bracts yellowish, thinly membranaceous, hyaline especially towards margins, lower ones 7–20 mm long and 3–8 mm wide, ovate-elliptic to lanceolate, acuminate, glabrous or only sparsely ciliate at margins. Calyx greenish-yellow becoming whitish-yellow, at first tubular, soon globosely or elliptically inflated, 12–16 mm long and 4–8 mm wide, with 20–30 parallel nerves, ± densely long appressed hairy becoming sparsely villose; teeth 3.5–9 mm long. Corolla pale sulphureous. Standard 14–22 mm long; limb 9–13 mm long, 5.5–8 mm wide, oblong-panduriform, towards the tip narrowing into an obtuse apex, often obviousely mucronulate at tip, sharply auriculate at base; claw 5–9 mm long, broadly cuneate. Wings 13–19 mm long; limb 6–8 mm long and 2–3 mm wide, narrowly oblong to oblong or at the apex somewhat expanded, obtuse; auricle 0.4–1 mm long; claw 7–12 mm long. Keel 12.5–17 mm long; limbs 5–6 mm long and 2.5–3.5 mm deep, triangular-obovate to ± oblong, with almost rectangular lower edge and ± concave upper edge, obtuse, minutely mucronulate; auricle very short; claw 7.5–12 mm long. Stamens at upper 3–5 mm free from each other. Fruit 6–7 mm long, 1.5–2.8 mm high and 2.5–3.5 mm wide. Seeds olive green, light to dark brown, ± flattened, 3–4.5 mm long and 1.5–2.8 mm wide, elliptic to broadly elliptic, mostly rugose, rarely (younger ones) smooth.
Flowering and fruiting time: V–VII.
Occurence: Mountainous dry stepps, with clay or limestone as substrate, alt. 1200–3600 m.
Distribution: Turkey, NE Iraq, Iran. Map 2.

Specimens seen:
1. Typical *A. chrysostachys*:

Turkey. A8 Erzurum: Dultu dagi, NW Oltu, 16.7.1989, 2300 m, *Nydegger 44454* (MSB) – distr. Olty, prope p. Karnawaz, 7.7.1911, *Sosnovsky* (B, foto MSB).

Iran. Prov. Tehran: Telu, NE Tehran, 1800 m, 4.6.1972, *Dini & Arazm 15752* (W) – Aragadj, nr. Varamine, 7400 ft, 30.6.1954, *Brown 1921* (W) – In m. Gerdene Kutschek prope urbem Teheran, 24.6.1843, *Kotschy 400* (G, G-BOIS, LE, W) – Demawend: bei Pul-i-Djadjerud, 29.6.1909, *Bornmüller 600* (B). – Prov. Markazi: inter Sultanabad et Kum, Latedar, 10.6.1895, *Strauss* (B, foto M) – In dit.urb. Sultanabad, Tefresch in montibus, VI.1897, *Strauss* (B) – ibidem, Kuh-Tefresch, VI.1897, *Strauss* (B!: foto MSB!) – In montibus ad Sultanabad, 26.5.1892, *Strauss* (BR) – In m. Kuh Gäsawend, 1.7.1909, *Strauss* (B) – Mowdere, 20.6.1890, 26.6.1892, *Strauss* (B) – In monte Tschehar-Khatun, ad m. Raswend, VI.1902, *Strauss* (LE, B) – In monte Raswend VII.1892, *Strauss* (B) – In monte Schahsinde, VI.1897, *Strauss* (B: foto MSB, G). – Prov. W. Azarbaijan: In jugo inter Balanesh et Oshnovieh, 1650–1900 m, 11.7.1974, *Rechinger 49279* (W) – 38 km S de Rezaiyeh, Darreh-ye-Ghasemlou, 1500–1650 m, 3.6.1978, *Matin & Daneshpajouh 38410* (W) – 15 miles SE Mahabad, 5000 ft, 20.5.1962, *Furse 2150* (W) – Oroumieh, Razhan, Khalil-kuh, 1600–1800 m, 9.7.1994, *Chehregani & Zarre 17877* (M, TARI, TUH) – Rezaieh, Band, 1450–1600 m, 15.6.1977, *Moussavi & Tehrani 36816* (W) – 44 km S de Rezaiyeh, Darreh-ye-Ghasemlou,

1850–1990 m, 10.6.1978, *Matin & Daneshpajouh 38385* (W) – In declivibus siccis inter Oshnoviyeh et Naqadeh, 1500 m, 8.7.1974, *Rechinger 49023* (W). – Prov. E. Azarbaijan: Maragheh, Kuh Sahand, 20.6.1965, *Esfandiari 6329 E* (W) – Prov. Zanjan: 15 km from Zanjan on the road to Bijar, 1900 m, 30.5.1974, *Wendelbo et al. 11855* (LE, W) – Dizaj-abad, 1500 m, 19.6.1983, *Moussavi et al. 41071* (W). – Prov. Kordestan: In saxosis et ad versuras 47 km W Bijar versus Divandarreh, 2000 m, 2.7.1971, *Rechinger 42649* (W) – Kowleh 65 km N of Sanandaj versus Divandarreh, 29.6.1974, *Rechinger 48525* (W) – Bijar to Sanandaj, 72 km to Sanandaj, 1950 m, 1.7.1971, *Termeh 40782* (W) – Bijar to Sanandaj, 60 km to Sanandaj, 2000 m, 2.7.1971, *Termeh 40879* (W) – Kowleh 65 km N of Sanandaj versus Divandarreh, 29.6.1974, *Rechinger 48525* (W) – 20' N of Sanandaj, 4500 ft, 17.5.1962, *Furse 2092* (W) – c. 18 km N of Sanandaj, 1500 m, 10.6.1959, *Wendelbo 1862* (BG, LE, W) – Sanandaj to Marivan, 16.6.1956, *Sabeti 22* (W) – 11 km W of Sanandaj, inter Sanandaj et Marivan, road cut bank, 26.5.1960, *Bent & Wright 526-201* (W) – Sanandaj, 1200–1400 m, 27.5.1963, *Jacobs 6729* (BG, W) – 26 km E of Sanandaj, 2200 m, 28.6.1965, *Ledingham, Zohary et al. 4237* (LE, W) – 15 km to sanandaj from Kamyaran, 1500 m, 7.7.1994, *Chehregani & Zarre 17852* (M, TARI, TUH) – In graminosis siccis jugi prope Salavatabad, 25 km E Sanandaj, 2300 m, 3.7.1971, *Rechinger 42797* (W) – Sanandaj to Hammadan, pass Salavat-abad, 2400 m, 3.7.1971, *Termeh 40959* (W). – Prov. Kermanshah: Weg nach Sanandaj, 18.5.1951, and 21.5.1951, *Sharif 2548, 2612* (W) – rocky top of Zagros mts., road to Ilam, 120 km SW of Kermanshah, 2000 m, 30.6.1965, *Ledingham & Bonvan 4262* (LE). – Prov. Hamadan: Aq Bulaq, c. 100 km N Hamadan, 15.4.–1.6.1960, *Rioux & Golvan 311* (W) – bei Yalpan, 25.5.1882, *Pichler* (G-BOIS, W). – Prov. Lorestan: In dit. urb. Burudjird, in montibus, VI.1898, *Strauss* (B) – Kharon bei Bisheh, 1300 m, 3.6.1937, *Köie 1264* (B, C, W) – In saxosis calc. 30 km SE Khorramabad versus Safid Dasht, 1750 m, 12.6.1974, *Rechinger 47779* (W) – Dorud region, hills betwen Sarawan and Dorud, about 16 km from Dorud, 16.6.1974, *Alava 13881* (TUR) – Shuturun-kuh foothills, Azna, 6000 ft, 6.5.1962, *Furse 1791* (W) – Paris Mt., 7000 ft, 28.5.1940, *Koelz 15880* (W). – Prov Bakhtiari: Oregon between Kuhreng and Damane, 2300 m, 1.6.1959, *Wendelbo 1718* (BG, LE, W). – Prov. Esfahan: prope Ispahan, *Aucher 4401* (G, G-BOIS, LE, P, W). – Not exactly to localize: In Prov. Aderbidjan, *Aucher 4401A* (G, G-BOIS, LE, P, W).

2. Specimens with a tendency to have shorter and thicker peduncles and longer leaflets consistent with the type of *A. chrysostachys* var. *kopetdaghensis*:

Iran. Prov. Khorassan: Shirvan, Namanlou, Golule, Cheshmeh-garbi, 2400 m, 19.7.1986, *Termeh et al. 41375* (W) – 30 km SW of Darreh Gaz, Tandureh Wildlife Reserve, Cheshmeh-e Shekerab, 5 km NE of Incheh Kekanlu, 2000 m, 9.7.1973, *Edmonson 1294* (W) – Kopet-Dagh, zwischen Kucan und Lutfabad, Paß Alamli, 2000 m, 14.7.1937, *Rechinger 1655* (BM, G-Aellen, W) – 40 mile Dareh-Gaz versus Gouchan, 2100 m. 24.7.1972, *Iranshahr & Zargani 15204* (W) – Dare-Gaz to Gouchan, Dordaneh, Allah-Akbar, 24.7.1972, *Iranshahr & Zargani 15217* (W) – Ghoutchan, Emamgholi to Darreh Gaz, Gappi, 2000 m, 15.7.1986, *Termeh et al. 41376* (W) – entre Kuchan et Bajgiran, 1100–1600 m, 3.7.1956, *Schmid 6314, 6315* (W) – Chakaneh Bala 40 km S Quchan, ad versuras, 1500–1600 m, 17.6.1975, *Rechinger 53723* (W) – Neyshabur, Sheykh Abol-Hassan, Binaloud, 1500–2250 m, 30.–31.7.1976, *Termeh & Tehrani 35141* (W) – environs de Mughan et versant nord de la Kuh-i-Binalud, 1900–2300 m, 20.–21.6.1956, *Schmid 6207* (LE, W) and *6237* (W) – In montibus serpentinicis inter Turbat-e Haidari et Assadabad, 27.5.1948, *Rechinger, Aellen & Esfandiari 4410* (W).

3. Forms with peduncles longer than the leaves and almost thin, consistent with var. *khorasanicus*:

Iran. Prov. Khorasan: Montes Kopet-Dagh, inter Kucan et jugum Alamli, 1600 m, 3.6.1948, *Rechinger & Aellen 4802* (B, G, M, W) – Montes Hazar Masdjid, inter Tolgor et Gash, c. 1800 m, 7.–10.6.1948, *Rechinger, Aellen & Esfandiari 5185* (W, G).

A. sosnowskyi can not be lectotypified, before the herbaria of BAKU and TBI will be studied. It is just a small form of *A. chrysostachys* with short, but largely inflated calyx. This form can be found in different areas and can not be taxonomically separated. The comparison of this taxon with *A. lagurus* (*A. lagopoides* rightly), made in Flora of Turkey, is irrelevant. The material which was determined in this work as *A. sosnowskyi* all belongs to *A. lagopoides*.

The most typical characters of *A. chrysostachys* are thin and hyaline bracts and stipules beside the yellow corolla limb. However some forms of *A. persicus* (forms, which are consistent with the type of *A. manucherii*) show also such characters of bracts and stipules. They can be separated from *A. chrysostachys* in respect to their purple calyx nerves and purple-tinged standard limb.

4. ***Astragalus glumaceus*** Boiss., Diagn. Pl. Or. Nov. 2: 69. 1843 ≡ *Tragacantha glumacea* (Boiss.) Kuntze, Revis. Gen. 2: 60. 1891. **Holotype**: Persia, *Aucher 1278* (G-BOIS!; Iso: P!, MSB!).

Fig. 1a

Plants 15–25(–40) cm high, with fragile thorns. Hairs 0.1–1.5 mm, on peduncles sometimes up to 2.5 mm and on the calyx up to 6 mm long, mostly straight. Stems prostrate or ascending, up to 15(–30) cm long, growing 1–5 mm per year, in first year 2–5 mm in diameter. Stipules chartaceous, yellow or whitish to yellow, with 5–8 parallel nerves in the free portion, 8–22 mm long, at a length of 4–7 mm adnate to the petiole, otherwise 2–10 mm connate, from triangular base lanceolate-acuminate, glabrous or ciliate at margins. Leaves 2–13(–18) cm long; rachides ± dense, white or whitish green, often rigid and thick, obliquely erect, longer ones mostly incurved, sparsely appressed shortly hairy to glabrous; petiole (1/5–)1/4(–1/3) the length of the rachid; end-thorn 1/3–1/1 the length of the uppermost leaflets; leaflets in 2–5 pairs, whitish green to light green, ± remote, 10–30 mm long and 3–12 mm wide, flattened, elliptic to broadly elliptic, obtuse or acute, with a mucro up to 3(–4) mm long, both sides sparsely shortly appressed or rarely spreadingly hairy, glabrescent. Inflorescence mostly sessile, dense or lax, flowering part 5–16 cm long and 3.5–4.5 cm in diameter, shorter than or as long or rarely longer than the leaves, at first ovate, becoming cylindrical; peduncle 0–5 cm long, densely to sparsely covered with appressed to subpatent short and long hairs. Bracts thickly membranaceous, not hyaline, yellowish, purple or brown at tip, (12–)17–27 mm long and 5–9 mm wide, broadly ovate at the base of the inflorescence to lanceolate-elliptic further up, longly acuminate, glabrous, younger ones sparsely ciliate. Calyx whitish or creamy, towards the teeth purple, at first tubular, soon inflated, 19–26 mm long and 4–10 mm wide; at fruiting time 22–28 mm long and 8–16 mm wide, globose to broadly elliptic, with 22–30 parallel nerves, densely long appressed hairy becoming densely to sparsely villose; teeth 7–12 mm long. Corolla claws pale yellow, limbs purple becoming light to dark brown. Standard 20–30 mm long; limb 12–18 mm long and 7–11 mm wide, elliptic-panduriform, shortly acuminate or rarely rounded at the apex, hastate-auriculate at base; claw 8–12 mm long, ± broadly cuneate. Wings 19–27 mm long; limb 9–12 mm

long and 2.5–3 mm wide, narrowly oblong to oblong, obtuse; auricle 0.7–1.2, mm long; claw 11–16 mm long. Keel 18–25 mm long; limbs 7.5–10 mm long and 3.5–4 mm deep, elliptic, with curved lower edge and concave upper edge, obtuse, minutely mucronulate; auricle distinct; claw 9–15 mm long. Stamens at the upper 5–6 mm free from each other. Fruit 6–11 mm long, 1.5–2 mm high and 3–4 mm wide. Seeds light to dark brown, ca. 4 mm long and 2.5 mm wide, elliptic-reniform, flattened, pitted.
Flowering and fruiting time: V–VIII.
Occurence: Mountainous dry stepps, with clay or limestone as substrate, sometimes at margins of loose walds of *Quercus brantii;* alt. 1100–2300 m.
Distribution: Iran: NW, W and C of Iran, along the Zagros and Elburz ranges. Map 3.

Specimens seen:

Iran. Prov. Tehran: Elburs, Kuh Daschteh, 2000 m, 15.8.1937, *Gauba 1477* (B). – Prov. Markazi: prope Djekab inter Sultanabad et Kaschan, VII.1903, *Strauss* (B) and VI.1904, *Strauss* (B, BM) – In m. Kuh-i-Emrullah, 3.6.1908, *Strauss* (B). – Prov. W. Azerbaijan: In declivibus siccis 5 km SW Naqadeh, 1500 m, 14.7.1974, *Rechinger 49373* (W) – In declivibus boreo-occidentalibus jugi inter Oshnovyeh et Ziveh, 1850 m, 14.7.1974, *Rechinger 49406* (W) – Chavan Bala, c. 13 km N of Maragheh, S of Kuh-e Sahand, 1965 m, 10.8.1966, *Wright 19* (W). – Prov. E. Azarbaijan: prope electric road in Kaflan Kuh, 1100–1500 m, 2.6.1971, *Lamond & Iranshahr 41046* (W) and *40821* (W) – Mianeh, Ghaphlan Kuh, 1500, m, 29.5.1971, *Iranshahr 41032* (W) – 5 km W de Mianeh vers Tabriz, 1100 m, 18.6.1978, *Termeh et al. 39849* (W) – 6 km NW of Shahindez, 1380 m, 4.6.1974, *Wendelbo et al. 12123* (LE, W) – Mianeh to Gharah-Chaman, 1300 m, 26.5.1987, *Maassoumi 64879* (M). – Prov. Zanjan: 27 km a Zanjan boreo-occidentem versus, ad viam versus Mianeh ducentem, 1500 m, 13.6.1977, Rechinger 56576 (W) – c. 10 km boreo-occid. ab oppido Zanjan, 26.7.1977, *Sojak 7699, 7701* and 5.7.1973: *7475, 7583* and *7593* (all PR) – Dizaj Abad, 1500 m, 19.6.1983, *Moussavi et al. 41072-E* (W) – 12 km from Zanjan on the road to Bijar, 1890 m, 16.7.1974, *Assadi & Amini 13543* (W) – In declivibus argillosis 85 km SW Zanjan versus Bijar, 1500 m, 30.6.1971, *Rechinger 42416* (W). – Prov. Kordestan: Bijar, Gaure-Chai, Kouh-e Bash, 2000–2100 m, 10.7.1968, *Iranshahr & Drezfoulian 40810* (W) – 5 km to Divandarreh from Sanandaj, 1650 m, 7.7.1994, *Chehregani & Zarre 17856* (MSB, TARI, TUH) – 26 km E of Sanandaj, 2200 m, 28.6.1965, *Ledingham, Zohary et al. 4242* (W) – inter Sanandaj et Salavatabad, 2000 m, 3.7.1971, *Rechinger 42825* (W) – Sanandaj to Hammadan, pass Salavat Abad, 1900 m, 2.7.1971, *Termeh 40914* (W). – Prov. Kermanshah: Kermanshah, Tagh-e Bostan to Parrow mts., 10 km on the sandy road after military station, 1500–1600 m, 6.7.1994, *Chehregani & Zarre 17814* (MSB,TARI, TUH) – 3 km W of Harsin, 60 km E of Kermanshah, 26.6.1965, Ledingham, *Bonvan, et al. 4203* (W) – Dry cultivated hilltops at Dinard, 40 km from Biston, 80 km NE of Kermanshah, 26.6.1965, *Ledingham & Zohary 4210* (LE) – 11 km to Sahneh from Kangavar, 1420 m, 6.7.1994, *Chehregani & Zarre 17808* (MSB, TARI, TUH) – 36 km W Tuiserkan, 1640 m, 9.6.1959, *Pabot 1575* (G). – Prov. Hammadan: Aq Bulaq, c. 100 km N Hammadan, 15.4.–1.7.1960, *Rioux & Golvan 312* (G, W) – Aghbolagh, *Pabot 12490-E* (W) – In monte Elwend, 1882, *Pichler 377* (B) – Kuh Alvand, 7.6.1965, *Bahar 6683* (W) – In mont. Gerae pr. Nehawend, VIII.1898, *Strauss* (B) – Nahavand, 1400–1500 m, 23.6.1963, *Jacobs 6987* (W) – auf trockenen Abhängen oberhalb Haydare, 29.6.1982, *Pichler* (W). – Prov. Esfahan: In m. Kuh-i-Kohrud, VI.1908, *Strauss* (B, W) – Ishabad, 20 km W of Najaf Abad, c. 1900 m, 12.6.1965, *Ledingham & Assefi 4142* (W) and *Asefi* in hb. PABOT *AE95* (G). – Prov. Lorestan: Burujird, 9.7.1942, *Koelz 18633* and *18639* (W). – Prov. Bakhtiari: at the village Kuhruye Hash, 39 km from Shahreza on the road of Semirom, 2300 m, 5.6.1974, *Alava 13542* (TUR). – Not exactly to localize: Persia, *Aucher 1278* (G-BOIS, P, MSB) – In Persiae occid. in montosis (sine indicatione loci), *Strauss* (B) – Dumbe Kemer, 24.6.1905, *Strauss* (B).

The species is easily distinguishable from all other species of the section by its large flowers. As mentioned above *A. glumaceous* and *A. kohrudicus* form the most isolated group in the section. See also the note under *A. kohrudicus*.

5. ***Astragalus hirticalyx*** Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 67. 1868 et l.c. 15(1): 110. 1869 ≡ *Tragacantha hirticalyx* (Bunge) Kuntze, Revis. Gen. 2: 945. 1891. **Lectotype** (here designated): In summo monte Aferowdagh Kurdistaniae Armeniae, inter lacum Wan et Prov. Müküs, 11000 ft, *Kotschy suppl. 807* (G-BOIS!; Iso: G-BOIS!, LE!, P!, W!: foto MSB)
= *A. mishouensis* Turrill, Kew Bull. 1930: 379. 1930. Holotype: N Persia, Tabris district, summit of Mishou Dagh, 30.8.1928, *Gilliat-Smith 2484* (K!: foto MSB!)
= *A. porphyrodon* C.C.Towns., Kew Bull. 25: 462. 1971. Holotype: Iraq, Helgord range, 3350 m, 3.9.1957, *Rawi & Serhang 24808* (K!; Iso: BAG).

Figures: TOWNSEND, Fl. Iraq 3: 376, pl. 61 (as *A. porphyrodon*). 1974.
Fig. 5 e

Plants 10–15 cm high. Hairs 0.1–1 mm, on peduncle up to 3.5 mm, on calyx up to 4 mm long. Stems prostrate to ascending, 1–9 cm long, growing 0.5–3 cm per year, in first year 1–2.5 mm in diameter. Stipules chartaceous, yellowish, with 5–13 parallel nerves at free portion, 10–16 mm long, at a length of 6–10 mm adnate to the petiole, otherwise 1.5–5 mm connate, lanceolate, acuminate, glabrous, sometimes ciliate. Leaves 0.9–7.5 cm long; rachides very dense, rigid, thick, straight, oblique to subhorizontal, densely to sparsely covered with appressed to subappressed hairs; petiole 1/4–1/3 the length of the rachid; end-thorn 1/2–3 times longer than the uppermost leaflets; leaflets in (3–)4–6 pairs, remote or sometimes dense, greyish-green, 4–16 mm long and 1.5–4 mm wide, narrowly oblong-elliptic to elliptic, mostly complicated, acute, with a mucro up to 1.5 mm long, densely to sparsely sericeous. Inflorescence shorter or as long as the leaves, ± dense, globose, 2–3.5 cm in diameter; peduncle 0.5–3 cm long, densely villose. Bracts thickly or thinly membranaceous, not hyaline or only at margins hyaline, yellowish, rarely red at tip, 8–15 mm long and 5–8 mm wide, broadly ovate to lanceolate-elliptic, glabrous, sometimes ciliate at margins. Calyx whitish or creamy, purple towards the teeth, at first tubular, later on ovoid to elliptically inflated, 10–14 mm long and 3.5–7 mm wide, with 13–17 parallel nerves, densely appressed hairy becoming sparsely villose; teeth 4–7 mm long. Corolla yellowish at claws, limbs pink to red or violet. Standard 15–20 mm long; limb 10–14 mm long and 6–7 mm wide, oblong-panduriform, retuse at tip, minutely mucronulate, sharply hastate at base; claw 5–6 mm long, broadly cuneate. Wings 14–17 mm long; limb 5.5–7.5 mm long and 2–3 mm wide, oblong, sometimes expanded in upper third, obtuse; auricle 0.3–0.7 mm long; claw 8–10.5 mm long. Keel 12–15 mm long; limbs ca. 5 mm long and 2.5 mm deep, obovate-triangular, with almost rectangular lower edge and straight or ± convex upper edge, obtuse, minutely mucronulate; auricle tiny; claw 7–10 mm long. Stamens at the upper 2.5–3.5 mm free from each other. Fruit 5–6.5 mm long, ca. 2 mm high and 3–4 mm wide. Seeds brown, ca. 3 mm long and 2.2 mm wide, broadly elliptic to rounded, pitted.
Flowering and fruiting time: VI–VIII.
Occurence: Mountainous stepps with ± scarce vegetation, and in association with other cushion-forming plants like *Astracantha spp.* and *Acantholimon spp.*, 2000–3100 m.
Distribution: E Turkey, Iraq, NW Iran. Map 3.

Specimens seen:

Turkey. Prov. Bitlis: Taurus Armenius, In monte Meleto (Meretug) Dagh districtus Bitlis, in humosis opimis, 2600–3100 m, 11.8.1910, *Handel-Mazetti 584* (W). – Prov. Van: In summo Agerow Dagh inter lacum Wan et Prov. Müküs, 11000 ft, 23.9.1859, *Kotschy 807* (G-BOIS, LE, P, W: foto MSB) – Gürpinar to Baskale, Güzeldere, Gecidi, 2760 m, 12.8.1987, *Engel 114* (MSB).

Iraq. MRO: Helgord range, 3350 m, 3.9.1957, *Rawi & Serhang 24808* (K).

Iran. Prov. W Azarbaijan: In monte Chalil Kuh prope Razhan, 2600–3200 m, 2.7.1974, *W.Rechinger & Renz 48846b* (W). – Prov. E Azarbaijan: 5 km E of Kandujan (= 33 km of Khosroshah), on Sahand mountain, 2900 m, *Grant 128* (W) – Kiyamaki Protected Region, Kiyamaki Dagh ad boreo-orientem a pago Miab, 2500–2600 m, 17.6.1977, *Rechinger 56856* (W) – Tabris district, summit of Mishou Dagh, 30.8.1928, *Gilliat-Smith 2484* (K: foto MSB) – near Tabriz, 22.8.1968, *Abai 13332* (W) – Gaimas mt. near Ardebil, 7800 ft, 17.7.1959, *Brown 2116 E & F* (W) – 29 km to Sarab from Ardebil, 2000 m, 5.7.1965, *Babakhanlu 19980* (W) – Sarab to Kuh Sabalan, 26.7.1965, *Termeh 13276* (W) – Montes Sabalan, in declivibus borealibus saxosis (Radar Road), 2650 m, 14. et 17.7.1971, *Lamond & Termeh 4784* (LE, W), in RECHINGER *44129* (W) – Ardebil, Ghotour-So, Kouh-e Sabalan, 2600 m, 17.7.1971, *Termeh 41021* (W).

A. mishoensis was mistakenly attributed to sect. *Rhacophorus* of the subgenus *Tragacantha* (today genus *Astracantha* Podlech). We could not find any significant difference between it and *A. hirticalyx*.

Shortly pedunculated forms of *A. persicus* seem similar to *A. hirticalyx*, but they are easily recognized by differences in the indumentum on the peduncle: In *A. hirticalyx* villose and hairs up to 3.5 mm long, in *A. persicus* (just shortly pedunculated forms) appressed with hairs up to 2 mm long.

Thin textured bracts separate *A. hirticalyx* from other shortly pedunculated species of the section, namely *A. tabrizianus*.

The specimens cited by MAASSOUMI (1995) as *A. hirticalyx* belong mostly to *A. uraniolimneus*.

See also the note of *A. uraniolimneus*.

6. ***Astragalus hymenocystis*** Fisch. & C.A.Mey., Bull. Soc. Imp. Naturalistes Moscou 26(2): 449. 1853 ≡ *Tragacantha hymenocystis* (Fisch. & C.A.Mey.) Kuntze, Revis. gen. 2: 945. 1891. **Lectotype** (PODLECH & SYTIN, here designated): ad limites Turciae distr. Khoi, Prov. Atropatanicae, 17.6.1828, *Szovits 544* (LE!; Iso: G-BOIS!, H!, L!, LE!, M!, P!, W!: foto MSB!)

= *A. sirensis* Turrill, Kew Bull. 1930: 382. 1930. Holotype: N Persia, Mt. Sir, Urmia distr., 27.5.1929, *Gilliat-Smith 2281* (K!).

Plants 10–20 cm high. Hairs 0.1–1.5 mm, on the peduncle up to 3 mm, on the calyx up to 4 mm long, straight or crispate. Stems from a prostrate base ascending, up to 13 mm long, growing 0.5–4 cm per year, in first year 1–3 mm in diameter. Stipules thinly membranaceous, yellowish white or white, with 1–3 parallel nerves at free, 8–13 mm long, at a length of 5–8 mm adnate to petiole, otherwise 0.5–1.5 mm connate, from a triangular base lanceolate, acuminate or acute, ciliate. Leaves 0.4–3.5 cm long; rachides very dense, mostly recurved and turning back, thin, flexible, densely spreading hairy; petiole 1/4–1/2 the length of the rachid; end-thorn 1/4–1/2(–1/1) the length of the uppermost leaflets; leaflets dense, grey or yellowish green, strongly complicated, 3–7 mm long and 2–3.5 mm wide, elliptic to broadly elliptic, towards the apex of the rachid obovate to orbicular, obtuse, minutely mucronulate or without

mucro, densely covered with short hairs and between them with dense subappressed ± long hairs, becoming simply pilose. Inflorescence overtopping the leaves; flowering parts densely globose, 2.5–3.5 cm in diameter; peduncle 2.5–5 cm long, longer or rarely shorter than the leaves, densely villose. Bracts thinly membranaceous, hyaline at margins, yellowish, 6–11 mm long and 3–6 mm wide, ovate to lanceolate, shortly acuminate, glabrous, only densely ciliate at margins. Calyx creamy with red to purple nerves, sometimes in upper part or on allover red to purple, at first tubular, very soon elliptically or globosely inflated, 9–18 mm long and 4–8 mm wide, with 12–15 parallel nerves, densely appressed pilose; teeth 4–7 mm long. Corolla creamy at claws, limbs pink to purple. Standard 16–21 mm long; limb 10–15 mm long and 5–9 mm wide, oblong-panduriform, often shallowly constricted in lower part; claw broadly cuneate, 5–6 mm long. Wings 15.5–20 mm long; limb 7–10 mm long and 2–3 mm wide, narrowly oblong, obtuse; auricle 0.3–0.7 mm long; claw 8.5–10.5 mm long. Keel 12–15 mm long; limbs 5–6 mm long and ca. 3 mm deep, obovate-triangular, with ± right-angeled lower edge and straight to concave upper edge, obtuse minutely mucronulate; claw 7–9.5 mm long. Stamens with free parts 3–4 mm long. Fruit 7–9 mm long, 1.5–2 mm high and 3–4 mm wide. Seed olive green to red or dark brown, 3.5–4.2 mm long and 2–2.8 mm wide, elliptic, pitted.
Flowering time: (V–)VI–VII.

6a. ***Astragalus hymenocystis*** Fisch. & C.A.Mey. subsp. ***hymenocystis***

Fig. 3 c

Hairs mostly brownish-yellow. Leaflets thick, elliptic to broadly elliptic or obovate, obtuse at tip. Calyx teeth 4–7 mm long, 1/2–1 times of the length of the tube.
Distribution: Known only from NW Iran (mountains N of Uroumieh lake). Map 4.

Specimens seen:

Iran. Prov. W Azerbaijan: ad limites Turciae distr. Khoi, Prov. Atropatanicae, 17.6.1828, *Szovits 544* (LE, G-BOIS, H, L, LE, M, P, W: foto MSB) – In jugo Qushchi inter Shahpur et Rezaiyeh, 1850 m, 13.6.1971, *Rechinger 41884* (W), *Lamond 4098* (W), *Iranshahr 14752* (W).

6b. ***Astragalus hymenocystis*** Fisch. & C.A.Mey. subsp. ***confiniorum*** Zarre & Podlech, **subsp. nov**.
Holotype: Iran, Prov. W Azarbijan, in monte Chalil Kuh prope Razhan, 2600–3200 m, 2.7.1974, *W. Rechinger & Renz 48846a.* (W).

Fig. 3 d

Differt ab subsp. *hymenocystis* indumento e pilis mere albis consistente, foliolis tenuibus, anguste oblongis vel raro anguste obovatis, antice acutis, calyx dentibus longioribus 6-12 mm longis, tubo aequilongis vel ad duplo longioribus.

Hairs pure white. Leaflets thin, narrowly oblong-elliptic, rarely narrowly obovate, mostly acute at tip. Calyx teeth 6–12 mm long, 1–2 times as long as tube.
Distribution: At the border Iran-Turkey. Map 4.

Specimens seen:

Turkey. Prov. Van: Muradiye, 2100 m, steinige Bergsteppe im Tal des Bendimahi-Flusses nordöstlich des Ortes, 17.7.1981, *Raus 4143* (B) – Tendürek Dagh, 2700 m, Spalten und Felsbänder in rötlichen Kalkfelsen am Rande alter Lavafelder am Ostfuß des Vulkans an der Straße Muradiye-Dogubayazit, 17.7.1981, *Raus 4115* (B) – Tendürek Dagh, 2000 m, offene Felssteppe am Ostfuß des Vulkans an der Straße Muradiye-Dogubayazit, 21.7.1981, *Raus 4174* (B).

Iran. Prov. W Azarbijan: In monte Chalil Kuh prope Pesan, 1800–2400 m, 1.7.1974, *Renz 48659* (W) – In monte Chalil Kuh prope Razhan, 2600–3200 m, 2.7.1974, *W. Rechinger & Renz 48846a* and *48846c* (W) – Chalil Kuh: In montibus supra selvana, 1800–2600 m, 4.7.1974, *Renz 48978* (W).

This species is very closely related to *A. lagopodioides*, epecially because some specimens of the latter show the tendency of having somewhat denser inflorescences. In this case fruiting material is easily to determine: *A. hymenocystis* has fruit 7–9 mm long and *A. lagopodioides* 4–5 mm long.

Since the limits between the two taxa are not sharp, and the fact that there are some intermediates between them, we have decided to attribute subspecific level to this new taxon. The presence of yellow hairs is very conspicuous in all of our specimens of subsp. *hymenocystis*, but more material is needed for the conclusion that the character is absolutely reliable. Another interesting difference between the two subspecies is that subsp. *confiniorum* generally growts at higher altitudes than subsp. *hymenocystis*.

7. ***Astragalus hymenostegis*** Fisch. & C.A.Mey., Bull. Soc. Imp. Naturalistes Moscou 26: 448. 1853 ≡ *Tragacantha hymenocystis* (Fisch. & C.A.Mey.) Kuntze, Revis. gen. 2: 945. 1891. **Lectotype** (PODLECH & SYTIN, here designated): ad pagum Seidkhodzi, 20.6.1828, *Szovits 491* (LE!; Iso: G-BOIS!, H!, L!, LE!, M!, MSB!, P!, W!: foto MSB!).

Fig. 4 d

Plants 15–30 cm high. Hairs white, 0.1–1.2 mm, on the peduncle up to 3 mm, on the calyx up to 4 mm long, mostly very thin and straight. Stems from prostrate base ascending, up to 17 cm long, growing 0.5–4 cm per year, in first year 1–3 mm in diameter. Stipules chartaceous, yellowish, not hyaline, with 8–13 parallel nerves at free portion, 7–20 mm long, at a length of 4–10 mm adnate to the petiole, otherwise 1–5 mm connate, from a narrow triangular base lanceolate, acuminate, glabrous, ciliate. Leaves 1–15 cm long; rachides dense, ± thick, rigid, obliquely erect to subhorizontal, densely covered with appressed hairs, later becoming tomentose; petiole (1/7–)1/4–1/3 the length of the rachid; end-thorn 1/5–1/2 the length of the uppermost leaflets; leaflets in (2–)4–8 pairs, ± dense, silver green, flattened or slightly complicated, 4–22 mm long and 1.5–5 mm wide, oblong-elliptic, acute or rarely obtuse, with a mucro up to 2 mm long, both sides densely covered with appressed to subappressed long straight hairs and under them sparely shortly tomentose. Inflorescence overtopping the leaves; flowering part dense, cylindrical, 5–12 cm long and 2.5–3 cm wide (including the bracts); peduncle thick, shorter, as long as or longer as the leaves, 3–16 cm long, densely villose. Bracts glumaceous, thick and rigid, persistent up to fruiting-time, creamy to light brown, sometimes purple at tip, 8–18 mm long and 7–12 mm wide, broadly ovate to rounded at base of inflorescence, elliptic further up, shortly acuminate at tip, densely to sparsely appressed pilose on the whole

surface or only at midrib and apex, ciliate at margins, inside mostly hairy at tip. Bracteoles rarely present, ca. 5 mm long, subulate-lanceolate. Calyx yellow to light brown, sometimes with purple teeth, with 15–20 parallel nerves, at first tubular, soon becoming elliptically inflated, 13–19 mm long and 4–7 mm wide, ± densely long appressed hairy becoming villose; teeth 5–6 mm long. Corolla pale yellow, limbs pink to violet towards margins. Standard 14–16 mm long; limb ca. 10 mm long and 5–8 mm wide, oblong-panduriform, slightly retuse at tip or sometimes minutely mucronulate, sharply hastate at base; claw 6–8 mm long, broadly cuneate. Wings 13–15.5 mm long; limb 6–7 mm long and 2–2.8 mm wide, narrowly oblong, obtuse; auricle 0.3–0.6 mm long; claw 7.3–10 mm long. Keel 12–14 mm long; limbs 5–6 mm long and 2.8–3 mm deep, obovate-elliptic, with broadly curved lower edge and ± convex upper edge, obtuse, sometimes minutely mucronulate; claw 7–9 mm long. Stamens at the upper 3–4 mm free from each other. Fruit 5–7 mm long, 1.5–2.5 mm high and 2.5–3 mm wide. Seeds light to dark brown, ± flattened, 3–4 mm long and 1.5–2.5 mm wide, elliptic to broadly elliptic, pitted.
Flowering and fruiting time: VI–VII.
Distribution: NW Iran, around Uroumieh. Map 5.

Specimens seen:

Iran. Prov. W. Azarbaijan: Ad pagum Seidkhodzi, 20.6.1828, *Szovits 491* (G-BOIS, H, L, LE, M, MSB, P, W) – Rezayeh, hill by the lake just N of Golman Khaneh, 1400 m, 1.6.1974, *Wendelbo et al. 11985* (LE, W) – In declivibus borealibus jugi Qushchi inter Shahpur et Rezaieh, 1700 m, 21.7.1974, *Rechinger 49804* (W) – N des Dorfes Mahmudan, zwischen Sero und Shahpur, 1600–1700 m, 8.7.1972, *Renz* (W) – Shahpur to Rezaieh, Avgan (montis), 1500–2000 m, 17.6.1970, *Termeh 14605* (W).

The very broad and thickly textured bracts of *A. hymenostegis* make it easy to recognize. But *A. tabrizianus*, another frequent species in the region, sometimes has the same bracts. In this case the relative size of inflorescence to leaves can be useful: *A. tabrizianus* has the inflorescence shorter than leaves, and in *A. hymenostegis* they are overtopping the leaves. The venation of the bracts is very peculiar in *A. hymenostegis*, i.e. the ends of the nerves are anastomose in contrast to all other species, in which they end parallely. However this character is sometimes very difficult to observe. Moreover we had too little material to be absolutely sure about the applicability of it. Therefore this character was not useful in the description and key. The bracts of this species are hairy inside; a character which can be observed in few other species of the section, namely: *A. tabrizianus, A. lagopoides* (not always) and *A. persicus* (rarely).

8. ***Astragalus kohrudicus*** Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 67. 1868, et l.c. 15(1): 109. 1869 ≡ *Tragacantha kohrudica* (Bunge) Kuntze, Revis. Gen. 2: 60. 1891. **Holotype**: prope Sof [et Kohrud], 13.5.1859, *Bunge & Bienert* (P!) (specimen unicum quod mihi [BUNGE] redol.)
= *A. thyrsiflorus* Sirj. & Rech.f., Repert. Spec. Nov. Regni Veg. 48: 121. 1940. Holotype: Iran, Keredj, bei Khur und Pashand, 3.6.1937, *Rechinger 674* (W!: foto MSB!; Iso: K!, ZT!).

Fig. 1 b

Plants 15–30 cm high. Hairs 0.1–3 mm, on calyx up to 6 mm long, mostly straight. Stems prostrate to ascending, up to 15 cm long, growing 1–4 cm per year, in first year

1–4 mm in diameter. Stipules chartaceous, yellow to whitish, with 3–5 parallel nerves at free portion, 9–15 mm long, at a length of 4–8 mm adnate to the petiole, otherwise 2–5 mm connate, from triangular base lanceolate, acuminate, glabrous or only at margins ciliate. Leaves 1.5–14 cm long; rachides dense, thick, rigid, obliquely erect or incurved, sparsely covered with shortly appressed or spreading hairs and between them with some longer subappressed ones; petiole 1/10–1/4 the length of the rachid; end-thorn 1/4–1/1 the length of the uppermost leaflets; leaflets in 3–9 pairs, green, remote, 5–26 mm long and 0.5–3 mm wide, complicated or rarely flattened, linear to narrowly oblong-elliptic, acute, with a mucro up to 2.5 mm long, both sides sparsely covered with shortly appressed to subappressed hairs, lower surface often with some patent hairs too. Inflorescence mostly sessile, dense, flowering part 5–15 cm long and 3.5–4.5 cm in diameter, shorter than the leaves, at first ovate, becoming cylindrical; peduncle 0–1.5 cm long, densely villose. Bracts thickly membranaceous, not hyaline, yellowish, purple or brown at tip (at first green), 7–20 mm long and 4–8 mm wide, broadly ovate at the base to lanceolate-elliptic towards the top of inflorescence, acute or shortly acuminate, glabrous, younger ones sparsely ciliate. Calyx creamy, towards the teeth purple, at first tubular, soon becoming inflated, 18–27 mm long and 5–14 mm wide, globose to broadly elliptic, with 20–30 parallel nerves, densely long appressed hairy becoming densely to sparsely villose; teeth 8–10 mm long. Corolla pale yellow at claws, limbs pink to dark purple (brown when dried). Standard 20–31 mm long; limb 11–18 mm long and 7–11 mm wide, elliptic-panduriform, shortly acuminate or rarely rounded at the apex, hastate-auriculate at base; claw 9–13 mm long, ± broadly cuneate. Wings 19–28 mm long; limb 8–13 mm long and 2.5–3 mm wide, narrowly oblong, obtuse; auricle 0.4–1.2, mm long; claw 12.5–16.5 mm long. Keel 19–26 mm long; limbs 7–10 mm long and 3.5–4 mm wide, elliptic, with slightly curved lower edge and concave upper edge, obtuse, minutely mucronulate; auricle distinct; claw 12–16 mm long. Stamens at the upper 5–6 mm free from each other. Fruit 6–11 mm long, 1.5–2 mm high and 3–4 mm wide. Seeds light to dark brown, ca. 4 mm long and 2.5 mm wide, elliptic-reniform, flattened, pitted.
Flowering and fruiting time: V–VI.
Distribution: Iran: Zagros and Elburz ranges. Map 4.

Specimens seen:

Iran. Prov. Tehran: Baragan (westl. von Keredj), 17.6.1934, *Gauba 4* (B) – 81 km W of Karaj, Behjatabad, 1680 m, 28.6.1972, *Foroughian & Hariri 15929* (W) – In ditione oppidi Keredj, in collibus prope Khur und Pashand, 3.6.1937, *Rechinger 674* (K, W, ZT) – 42 km W of Karaj, 1510 m, 25.6.1972, *Foroughian 16031* (W) – 35 km NW of Karaj, Valian, 1790 m, 24.6.1972, *Foroughian 15839* (W) – Sorkhe-hesar, Haraz road, 1530 m, 3.6.1974, *Foroughi et al. 12468* (W) – Sorkhe Hesar NE Tehran, 1400 m, 18.6.1974, *Amin & Bazargan 19018* (W). – Prov. Zanjan: Ghazvin to Zanjan, 25 km to Ghazvin, 29.6.1971, *Termeh 40783-E* (W) – Kordan inter Keredj et Kazvin, *Gauba 566* (W). – Prov. Esfahan: prope Ssof, inter Isfahan et Teheran, V.1859, *Bunge* (*& Bienert*) (P).

The species is closely related to *A. glumaceous*. Both of them are characterized by large flowers. *A. kohrudicus* has a smaller distribution area, which is limited to northern cental Iran.

Shortly acuminate to acute bracts and narrower leaflets, which are mostly complicate are the characters which make separation of *A. kohrudicus* from *A. glumaceous* easy.

9. ***Astragalus lagopodioides*** Vahl, Symb. Bot. 1: 64. 1790. ≡ *Astragalus lagopoides* Lam. var. *β*, Encycl. Méth. Bot. 1: 322. 1783. **Lectotype** (designated here): 'Tragacantha orientalis vesicaria, floribus purpureis in capitulum pedunculo donatum congestis', *Tournefort* cor. 30 (P-TOURNEFORT!; Iso: B-WILLD 14086/2!, H!).
= *A. zohrabi* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 68. 1868 et l.c. 15(1): 112. 1869 ≡ *Tragacantha zohrabi* (Bunge) Kuntze, Revis. gen. 2: 949. 1891. Syntypes: Armenia prope Baibut. *Bourgeau 69*; dto., *Zohrab* (K). Lectotype (here designated): Armenia prope Baibut. *Bourgeau 69* (P!; Iso: G!, M!, W!)
= *A. splendens* Sirj. & Rech. f., Symb. Bot. Upsal. 11(5): 21. 1952. illeg. [non (Dougl.) Tidest. 1937]. Holotype: Kerikas Dere, 5 km SW Arpat, 24 km SW Gevas (Vastan), 2400 m, 26.6.1939, *Frödin 295* (W!)

Figures: WILLDENOW, Mém. Acad. Roy. Sci. Hist.(Berlin): tab. 1, fig. 4. 1794.
Fig. 3 b

Plants 10–15 cm high, up to 25 cm including inflorescence. Hairs 0.1–1.5 mm, on peduncle up to 3 mm and on calyx up to 4.5 mm long, crispate or straight. Stems ascending, up to 15 cm long, growing 1–5 cm per year, at first year 1–3 mm in diameter. Stipules thinly membranaceous, hyaline at free portion, yellowish white, with 3–8 parallel nerves at free portion, 6–16 mm long, at a length of 3–9 mm adnate to the petiole, otherwise 0.5–2 mm connate, from a triangular base lanceolate, acute or acuminate, ciliate, otherwise glabrous. Leaves 0.7–5 cm long; rachides very dense, thin, flexible, mostly curved, obliquely erect to horizontal, lower ones deflexed, densely or sparsely spreading hairy; petiole 1/4–1/2 the length of the rachid; end-thorn 1/5–1/2 the length of the uppermost leaflets; leaflets in 3–6(–8) pairs, dense, grey green, weakly complicate to flattened, 3–14 mm long and 1–2.5 mm wide, linear to narrowly elliptic, acute, with a mucro 0.2–1 mm long, both sides densely covered with appressed to subappressed hairs. Inflorescence overtopping the leaves; flowering part loose, 3–9 cm long and 3–3.5 cm in diameter, globose to cylindrical; peduncle longer or rarely shorter than the leaves, 2–9 cm long, densely villose, later on glabrescent. Bracts thinly membranaceous, hyaline at margins, yellowish or purple (especially at tip), 8–15 cm long and 2.5–6 mm wide, broadly ovate to lanceolate-elliptic, acuminate, wholly glabrous or at apex and midrib sparsely pilose. Bracteoles rarely present, mostly single, 4–6 mm long, subulate-lanceolate, ciliate. Calyx creamy, red to purple in upper part or entirely, before anthesis tubular, soon globosely to elliptically inflated, 10–18 mm long and 3–7 mm wide, with 12–17 parallel nerves, densely covered with appressed to subappressed long hairs becoming sparsely villose; teeth 4–12 mm long. Corolla limb pink or mauve towards margins. Standard 15–22 mm long; limb 10–17 mm long and 5–8 mm wide, oblong-panduriform, shallowly constricted at lower third, retuse at tip, sometimes minutely mucronulate, hastate-angulate at the base; claw 4–5 mm long, broadly cuneate. Wings 14–19 mm long; limbs 6–9 mm long and 1.5–3 mm wide, narrowly oblong, sometimes somewhat enlarged towards the apex, obtuse; auricle 0.3–0.6 mm long; claw 7.5–9.5 mm long. Keel 12–15 mm long; limbs 5–6 mm long and 2.5–3 mm deeep, triangular-obovate, obtuse, minutely mucronulate; claw 7–9.5 mm long. Stamens at the upper 3–4 mm free from each other. Fruit 4–5 mm long, 1.5–2 mm high and 2.5–3 mm wide. Seeds olive green to dark brown, 2.5–3.5 mm long and 2–2.5 mm wide, broadly elliptic to almost rounded, pitted.
Flowering and fruiting time: VI–VIII.
Distribution: E Turkey. Map 5.

Specimens seen:

Turkey. Prov.Erzurum: Armenia prope Baibut, *Bourgeau 69* (G, M, P, W) – Oltu, 5 km W Sihsor, 1800 m, 26.6.1988, *Nydegger 43485* (MSB) – Gümüsane, Bayburt to Askale, nahe Bayburt, 1650 m, 21.8.1987, *Engel 156* (MSB) – 2 km N Bayburt, 1380 m, 12.6.1988, *Nydegger 43317* (MSB). – Prov. Gevas: Kerikas Dere, 5 km SW Arpat, 24 km SW Gevas (Vastan), 2400 m, 26.6.1939, *Frödin 295* (W!). – Prov. Van: distr. Gevas: Artos Dag., 14.7.1954, *Davis & Polunin 22733* (M) – N-seite des Artos dagi, unmittelbar S der Stadt Gevas, 2000–2200 m, 22.7.1978, *Ehrendorfer et al. 787-93-11* (MSB) – Pelli dag, between Van and Tatvan, 2000–2500 m, 29.6.1968, *Rix et al. 728* (M) – In summo jugi inter Bashkale et Hoshap, 2700 m, 30.6.1975, *Rechinger 1975* (W) – Slopes above Ereek golu, 1800 m, 10.6.1985, *Archibald 6627* (M) – Gürpinar to Baskale; Güzeldere Gecidi, 2900 m, 12.8.1987, *Engel 118* (MSB) – Van to Catak, 8 km nach Kiziltas, 2150 m, 13.8.1987, *Engel 125* (MSB). – Not to localize: In Armenia, *Aucher 2439* (W).

Because of having lax inflorescence the species is located in the same group with *A. sciureus, A. paralurges* and *A. rubrostriatus*. However in *A. lagopdioides* the limbs both of standard and wings are long in comparison to the claw, this character connect it to the group *A. hymenocystis* and *A. uraniolimneus*. Some forms of *A. lagopodioides* may have a somewhat denser inflorescence. These forms can be confused with *A. uraniolimneus*. However in such a case characters of the rachides must be used to recognize the specimens definitively. See also the note under *A. uraniolimneus*.

The record of *A zohrabi* (see the synonyms) from Iran (MAASSOUMI 1995) is surely a mistake. Unfortunately we have not seen any of material cited as *A. zohrabi* by Maasoumi. However we had a large collection from the region around Uroumieh, and none of our plants can be attributed to *A. lagopodioides*.

10. ***Astragalus lagopoides*** Lam., Encycl. Méth. Bot. 1: 322. 1783 ≡ *A. lagurus* Willd., Mém. Acad. Roy. Sci. Hist. (Berlin) 1794–1795: 28. 1794 ≡ *Tragacantha lagopoides* (Lam.) Kuntze, Revis. Gen. 2: 945. 1891 ≡ *Tragacantha lagurus* (Willd.) Kuntze, Revis. Gen. 2: 945. 1891. **Typus**: 'Tragacantha orientalis, floribus luteis in capitulum longe pediculo donatum congestis', *Tournefort* cor. 30 (B-WILLD 14087!: as *A. lagurus* Willd., G-DC!, M!)

= *A. lagurus* Willd. var. *brachypodus* (Boiss.) Boiss., Fl. Or. 2: 385. 1872 ≡ *A. brachypodus* Boiss., Diagn. Pl. Or. Nov. 2: 69. 1843 ≡ *Tragacantha brachypodia* (Boiss.) Kuntze, Revis. Gen.: 943. 1891. Syntypes: In Persia, *Aucher 3835* (G!); *1359bis*. Lectotype (here designated): In Persia, *Aucher 1359bis* (G-BOIS!; Iso: K!)

= *A. lagurus* Willd. var. *flavus* Trautv., Trudy Imp. S.-Petersburgsk. Bot. Sada 4: 129. 1876. Typus: Turcia distr. Erzerum, in itinere Chnis-Kala versus, *Radde* (E!)

= *A. karsianus* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 15(1): 115. 1869 ≡ *Tragacantha karsiana* (Bunge) Kuntze, Revis. Gen. 2: 945. 1891. Holotype: Armenia prope Kars, VII.1867, *Radde 280* (P!, Iso: LE!)

Figures: WILLDENOW, Mém. Acad. Roy. Sci. Hist.(Berlin): tab. 2, fig. 2. 1794; PALLAS, Species Astragalorum : tab. XVI. 1800; De CANDOLLE, Astragalogia: tab. 36. 1802.
Fig. 4 c

Plants 10–30 high, up to 50 cm including inflorescence. Hairs white, 0.1–1.5 mm, on the peduncle up to 2.5 mm, and on the calyx up to (3–)4 mm long, mostly very

thin. Stems ascending, up to 20 cm long, growing 1–6 cm per year, in first year 1–3.5 mm in diameter. Stipules chartaceous, yellowish white, not hyaline, with 5–7 parallel nerves at free portion, 12–30 mm long, at a length of 6–20 mm adnate to the petiole, otherwise 3–6 mm connate, free portions triangular, acuminate, younger ones sparsely appressed pilose, becoming glabrous, ciliate. Leaves 1.5–15 cm long; rachides ± dense, thick, rigid, mostly straight or rarely recurved, obliquely erect to subhorizontal, older ones sometimes deflexed, densely covered with appressed to subappressed straight hairs; petiole 1/4–1/3 the length of the rachid; end-thorn 1/5–1/2 the length of the uppermost leaflets; leaflets in 4–8 pairs, ± remote, silvery-green, mostly flattened or weakly complicate, 7–26 mm long and 1.5–6 mm wide, narrowly oblong to oblong, acute, with a mucro up to 2.5 mm long, both sides densely sericeous hairy or lower side with some subappressed hairs on the midrib. Inflorescence overtopping the leaves, very rarely shorter than leaves; flowering part dense, ovate to cylindrical, rarely globose, 3–10 cm long and 2.5–3.5 cm wide (including bracts up to 4 cm wide); peduncle thick, shorter, as long as or longer than the leaves, (1–)3–30 cm long, densely covered with short appressed hairs up to 1.5 mm long and between them some subappressed thicker ones up to 2.5 mm long. Bracts glumaceous, persistent up to fruiting-time, yellow to creamy, sometimes red at extreme tip, 14–23 mm long and 3.5–8 mm wide, elliptic to narrowly elliptic, rarely ovate, very long acuminate, densely to sparsely appressed pilose, glabrescent except for the tip and midrib. Bracteoles rarely present, whitish, ca. 4 mm long, linear-spathulate, sparsely villose. Calyx yellow to light brown, sometimes with purple teeth, with 15–20 parallel nerves, at first tubular, soon becoming elliptically inflated, 13–19 mm long and 4–7 mm wide, ± densely long appressed hairy becoming villose; teeth 5–6 mm long. Corolla limb yellowish, red to dark purple. Standard 14–16 mm long, rarely sparsely appressed shortly hairy on dorsal side; limb 7–11 mm long and 4–8 mm wide, oblong-panduriform, retuse at tip or sometimes minutely mucronulate, acutely hastate at base; claw 6–7 mm long, broadly cuneate. Wings 13–16.5 mm long; limbs 5–7 mm long and 1.5–3 mm wide, narrowly oblong, obtuse; auricle 0.3–0.8 mm long; claw 8.5–10 mm long. Keel 12–14 mm long; limbs 5–6 mm long and 2.8–3 mm deep, obovate-elliptic, with broadly curved lower edge and ± convex upper edge, obtuse, sometimes minutely mucronulate; claw 7–9 mm long. Stamens at upper 3–4 mm free from each other. Fruit 5–7 mm long, 1.5–2.5 mm high and 2.5–3 mm wide. Seeds light to dark brown, ± flattened, 3–4 mm long and 1.5–2.5 mm wide, elliptic to broadly elliptic, pitted.
Flowering- and fruiting-time: VII–IX.
Distribution: E Turkey, Armenia, Azerbeidzhan, NW Iran. Map 10.

Specimens seen:

Turkey. Prov. Nevsehir: Ürgüp-Develi, Topuzdagi Gecidi, 21.7.1992, 1550 m, *Nydegger 46830* (MSB). – Prov. Kayseri: Cappadocia, Ali Dagh, a 7 km SE de Cesaree (Cappadoce), 1400 m, VII./VIII.1856, *Balansa 943* (G-BOIS, MSB, W, ZT) – Ali dagi, SÖ Kayseri, Osthang oberhalb Resadiye Köyü, 1350–1800 m, 8.7.1969, *Buttler 13894* (M). – Prov. Sivas: beim Dorf Hyouk und vom Haly, Akdagh, 1600 m, VI.1911, *Siehe 365* (W). – Prov. Bayburt: In collibus ad Dudezard, prope Baibut, 28.7.1862, *Bourgeau 74* (B, C, G-BOIS, M, W, ZT). – Prov. Erzurum: circa Erzeroum, VII.1853, *Huet Du Pavillon 169* (G-BOIS, W, ZT). – Prov. Agri: Armenia prope Kars, VII.1867, *Radde 280* (P, LE) – Chorasan, am Paß Velibaba Gedik in etwa 2500 m, 4.8.1962, *Höpflinger* (C, W) – In jugo inter Agri (Karaköse) et Horasan, 2000–2500 m, 3.8.1965, *Rechinger 32805* (M, W) – inter Agri et Horasan, 45 km W Agri, 4.–5.1957, *Rechinger 14991* (W) – 12 km N of Zara, 1700 m, 12.7.1971, *Andersen et al. 2200* (C) – Prope Dogubayazit, c. 2000 m, 4.–5.9.1957, *Rechinger 14972* (W) – Aufstieg zum Ararat, S Dogubayazit, Ganikor, Ibrahim Karo, Camp III, Araratgipfelzone, 2400 m, 13.–17.8.1969, *Albertshofer & Schauer* (M). – Prov. Urfa: Siverek, 15 km to Karabahce, 1800 m,

20.6.1984, *Gönül Kaynak K16* (B). – Prov. Bitlis: 56 km E Kücüksu (= Kotum), 2 km W unterhalb des Kuzgunkiran-Passes, 2050 m, 21.7.1978, *Ehrendorfer et al. 787-89-6* (WU) – Bitlis, Hanemir Dag, von Oboskü Köyü aus, 2400 m, 10.8.1987, *Engel 109* (MSB) – Nemrud Dag, 2600 m, 9.8.1987, *Engel 99* (MSB). – Prov Van: Ercis to Delicay, weiter nach Pay Köyü, 14.8.1987, *Engel 131* (MSB). – Not lo localize: Cappadoce or., 1834, *Aucher 2327* (W).

Armenia. Distr. Ashtarak, in declivibus montis Arailer, in vicinitate pagi Egvart, 1300–1900 m, 15.7.1975, *Vasak* (B, M) – On road from Erevan to Sevan Lake, c. 20 km N Erevan, 3.8.1984, *McNeal et al. 369* (C) – Lacus Gokcza, 6.8.1929, *Fomin* (C, ZT) – dto., 6.9.1912, *Rübel 13144* (ZT) – Distr. Ararat, montes Gegamski Khrebet, loco Khach-Karer, 1700–1900 m, 9.7.1975, *Vasak* (B, M, W) – Montes Gegamski Khrebet, in vicinitate ruinarum pagi Akhkeng, 1800–2100 m, 10.7.1975, *Vasak* (B, M, W) – Distr. Abovyan, montes Gegamski Khrebet, in clivis montis Hadis, in vicinitate pagi Zar, 1700–2000 m, 14.7.1975, *Vasak* (M).

Azerbeidzhan. Nachitschewan: pr. Khoshadara in Prov. Nachitschewan, 3.7.1829, *Szovits 468* (B, G-BOIS, LE, M, W, ZT) – Prope pagum Beczenag, distr. Nachiczevan, 4.7.1901, *Fomin 451* (B, LE) – dito, V.1847, *Buhse 351* (G-BOIS, LE).

Iran. Prov. W Azarbaijan: distr. Khoi, 17.7.1828, *Szovits 546* (G-BOIS, LE, M, W, ZT) – Maku, Kouhe Ghadjeh Dagh, 2100–2250 m, 10.8.1971, *Termeh 40876* (W) – In monte Ghogeh Dagh W Bazorgan ad confines Turciae, 2100–2250 m, 1.8.1971, *W. Rechinger 43996* (W) – Kuh Kani Ziarat N Habashi Bala prope Qotur, 2300–3000 m, 18.7.1974, *W. Rechinger & Renz 49643, 49644* (W) – In jugo inter Oshnovieh et Ziveh, 2000–2200 m, 14.7.1974, *Rechinger 49378* (W). – Prov. E Azarbaijan: inter Sofian et Marand, 6.1859, *Bunge* (G-BOIS) – Qara Dagh, in monte Kiyamaki Dagh (Kamcheh) prope Daran SE Jolfa, 1400–2400 m, 26.7.1971, *Termeh 43787, 41020* (W) – In jugo inter Marand et Sufian, 1600–1750 m, 6.6.1971, *Rechinger 41250* (W). – Not exactly to localize: Armenia, *Aucher 1245* (G-BOIS, LE, W).

Specimens with globose inflorescence shorter than the leaves:

Turkey. Prov. Van: Ercis to Delicay, weiter nach Pay Köyü, 2150 m, 14.8.1987, *Engel 127* (MSB).

Armenia. Steppe um Isardar-Bulagh bei Ararat, c. 2500 m, 1.9.1912, *Rikli* (ZT).

This oldest described species of the section has been named for a long time as *A. lagurus* by mistake. The very long acuminate bracts are the most characteristic feature of the species, and it is mostly very easy to identify. The forms of the species with short peduncles (*A. brachypodus* ≡ *A. lagurus* var. *brachypodus*) can be confused with *A. tabrizianus* or *A. velenowskyi*. They are distinguishable from *A. tabrizianus* by following characters:

– The corolla of *A. tabrizianus* is always red to purple, that of *A. lagopoides* whitish-yellow or purple. All specimens with short peduncles of *A. lagopoides* have yellow corolla.

– The bracts of *A. tabrizianus* are mostly shortly acuminate in contrast to *A. lagopoides* with long acuminate bracts.

– The calyx of *A. tabrizianus* become inflated soon after anthesis, but that of *A. lagopoides* much later.

– Bracts of *A. tabrizianus* are caducous, but persistent in *A. lagopoides*.

See also the notes about *A. persicus*.

11. *Astragalus laguriformis* Freyn, Bull. Herb. Boiss. 5: 602. 1897 ≡ *A. laguroides* Freyn non Pall. nom. illeg., Bull. Herb. Boiss. 3: 180. 1895. **Holotype**: [Iraq] Kurdistania, in montis Kuh-Sefin reg. infer. ad pag. Schaklava (ditionis Erbil), 1000 m, 4.6.1893, *Bornmüller 1194* (BRNM!; Iso: B!: foto MSB!, JE!: erronnee *1094*, W!).

= *A. wanensis* (Bornm.) ex Rech. f., Dulfer & Patzak, Sirjaevii fragmenta Astragalogica. V. Sect. *Hymenostegis*. – Sitzungsber. Österr. Akad. Wiss. Math.-Naturwiss. Kl., Abt. 1, Biol. 168/2: 107, 113. 1959. Lectotype (designated here): Turkey, Kurdistania turcica: In aridis ad lacum Wan, 2500 m, 12.6.1899, *Kronenburg* (WU!).
= *A. trifoliastrum* Hub.-Mor. & V.A.Matthews, Notes Roy. Bot. Gard. Edinburgh 29: 301. 1969. Holotype: Turkey, B9 Van, Van-Hosap, 20 km N Van, 1950 m, 8.7.1951, *Renz & Simon* in hb. HUBER-MORATH *11467* (G!).

Figures: TOWNSEND, Fl. Iraq 3: 374, pl. 60. 1974.
Fig. 5 d

Plants 10–25 cm high. Hairs 0.3–1 mm, on peduncle up to 2.5 mm, on calyx up to 5 mm long, mostly thin, straight, the shorter ones inflated at the base. Stems from a prostrate base ascending, up to 20 cm long, growing 1–7 cm per year, in first year 1–3 mm in diameter. Stipules chartaceous, yellowish, not hyaline, with 1–3 parallel nerves at free portion, 5–12 mm long, at a length of 3–8 mm adnate to the petiole, otherwise 1–4 mm connate, free portions from a triangular base acuminate, younger ones sparsely appressed pilose becoming glabrous, ciliate. Leaves 0.7–7.5 cm long; rachides remote, rigid, thick, straight, oblique patent, densely appressed hairy becoming glabrous; petiole ca. 1/3 the length of the rachid; end-thorn ca. 1/2 the length of the uppermost leaflets; leaflets in 1–3(–4) pairs, remote, silvery-green becoming yellowish green with age, 7–20 mm long and 2–3.5 mm wide, narrowly oblong, flattened, acute, with a mucro up to 3 mm long, both sides densely sericeous. Inflorescence shorter or as high as the leaves; flowering part ± dense, globose to ovate, 2–5 cm long and 2.5–3 mm wide; peduncle 1–3 cm long, densely long appressed hairy. Bracts thickly membranaceous, not hyaline, yellowish, turning to red at extreme tip, 13–22 mm long and 4–8 mm wide, broadly ovate to lanceolate-elliptic, very long acuminate, sparsely shortly appressed pilose especially on midrib and at tip. Calyx whitish to creamy, with red teeth, at first tubular, soon oblong-elliptically inflated, 14–18 mm long and 5–7 mm wide, with 17–22 parallel nerves, densely long appressed hairy later on glabrescent; teeth 5–7 mm long. Corolla limb red to purple. Standard 15–19 mm long; limb 9–12 mm long and 6–7 mm wide, oblong-panduriform, retuse at tip, minutely mucronulate, hastate at base; claw 6–7 mm long, broadly cuneate. Wings 14–17 mm long; limbs 6–7 mm long and 2–3 mm wide, narrowly oblong, obtuse; auricle 0.4–0.7 mm long; claw 8.5–10.5 mm long. Keel 12–14 mm long; limbs c. 5 mm long and 3 mm deep, obovate-oblong, with almost rectangular bent lower edge and ± convex upper edge, obtuse, often minutely mucronulate; claw 7–10 mm long. Stamens at upper 3–4 mm free from each other. Fruit and seeds unknown.
Distribution: E Turkey and NE Iraq. Map 6.

Specimens seen:

Turkey. Prov. Van: Van-Hosap, 20 km N Van, 1950 m, 8.7.1951, *Renz & Simon 11467* in hb. HUBER-MORATH (G) – Kurdistania turcica: In aridis ad lacum Wan, 2500 m, 12.6. 1899, *Kronenburg* (WU)

Iraq. Rowanduz District (MRO): Kurdistania, in montis Kuh-Sefin reg. infer. ad pag. Schaklava (ditioinis Erbil), 1000 m, 4.6.1893, *Bornmüller 1194* (BRNM, B: foto MSB, JE: erronnee *1094*, W).

This species is cosely related to *A. hirticalyx*. It differs from all other species with short peduncles in having only 1–3(–4) pairs of leaflets per leaf Although in other species of the section some specimens can be found, whose leaves are few-paired too, but in these specimens such leaves are very rare, while in *A. laguriformis* leaves with

4 pairs of leaflets are very rare. The internodes of *A. laguriformis* are also somewhat longer in comparison with other species of the subsect. *Hymenostegis*.

We can not confirm the occurence of *A. laguriformis* in Iran (MAASSOUMI 1995). The specimens cited by MAASSOUMI as *A. laguriformis* belong most probably to *A. tabrizianus*.

12. ***Astragalus nervistipulus*** Boiss., Fl. Or. 2: 384. 1872. **Lectotype** (here designated): In monte Pir Omar Gudrun Kurdistaniae, VI.1867, *Haussknecht 333* (G-BOIS!; Iso: G-BOIS!, JE!, MSB!, W!).

= *A. brunsianus* Bornm., Beih. Bot. Centralbl. 33(2): 284. 1915. Holotype: Teheran, hinter Deschon-tepe, 10.5.1909, *Bruns* (B!: foto MSB!; Iso: HBG!).

= *A.chrysostachys* Boiss. var. *dolichourus* Sirj. & Rech.f., Anz. Österr. Akad. Wiss., Math.-Naturwiss. Kl. 1955: 109. 1955. Lectotype (here designated): Kuh-Tscha-Siah bei Siwend, 16.7.1885, *Stapf 1073* (WU!; Iso: B!: foto MSB!, WU!).

Fig. 2 b

Plants 15–40 cm high. Hairs 0.3–1.5 mm, on peduncle up to (2–)3.5 mm and on the calyx up to (4.5–)6 mm long, thin. Stems mostly from a prostrate base ascending, up to 20 cm long, growing 0.5–4 cm per year, in first year 1.5–4 mm in diameter. Stipules thinly membranaceous, ± hyaline, whitish with yellow nerves, with 3–8 parallel nerves at free portion, 8–27 mm long, at a length of (3–)4–15 mm adnate to the petiole, otherwise 2–9 mm connate, triangular, acute, glabrous, sparsely ciliate at margins. Leaves 1.5–16 cm long; rachides ± remote, rigid, thick, straight or incurved, obliquely erect to subhorizontal, rarely deflexed, densely covered with appressed to subappressed hairs, later on glabrescent; petiole 1/5–1/3 the length of the rachid; end-thorn 1/10–1/2 the length of the uppermost leaflets; leaflets in 3–8 pairs, greyish green, ± remote, 6–27 mm long and 1.5–4 mm wide, mostly flattened, linear to narrowly oblong, acute, with a mucro up to 1.5 mm long, both sides densely sericeous. Inflorescence overtopping the leaves; flowering part dense, 7–12 cm long and 3–4 cm in diameter, cylindrical; peduncle mostly very thick, 7–11 cm long, ± as long as the leaves, densely covered with short appressed hairs up to 1.5 mm long and between them some subappressed thicker ones up to 3.5 mm long. Bracts easily falling, thickly membranaceous, not hyaline or only so at margins, yellowish, sometimes with purple tip, 13–18 mm long and 3–8 mm wide, broadly ovate at the base of the inflorescence to lanceolate-elliptic further up, shortly acuminate, glabrous, ciliate. Calyx pale yellow or creamy with purple teeth, younger ones in upper part or as whole purple, 16–23 mm long, 4–7 mm wide, at first tubular, soon becoming elliptically inflated, with 17–22 parallel nerves, sparsely villose; teeth 8–12 mm long. Corolla limb pink, sometimes purple towards margins. Standard 17–24 mm long; limb 12–16 mm long and 6.5–8 mm wide, oblong-panduriform, rounded at the apex, sometimes minutely mucronulate, hastate-auriculate at base; claw 5–8 mm long, broadly cuneate. Wings 15.5–22 mm long; limbs 8–11 mm long and ca. 3 mm wide, narrowly oblong, obtuse; auricle 0.3–1 mm long; claw 8–12 mm long. Keel 14–18 mm long; limbs 5–6 mm long and ca. 3 mm deep, obovate-triangular to oblong, with ± rectangular bent lower edge and straight upper edge, obtuse, minutely mucronulate; claw 9–12 mm long. Stamens at upper 4–5 mm free from each other. Fruit 7–8 mm long, 1.5–2.2 mm high and 3–4 mm wide. Seeds olive green to light brown, 4–4.5 mm long and ca. 3 mm wide, elliptic, ± flattened, nearly smooth.

Flowering and fruiting time: V–VII.

Distribution: NE Iraq, W Iran. Map 5.

Specimens seen:

Iraq. Rowanduz Distr. (MRO): In monte Pir Omar Gudrun Kurdistaniae, VI.1867, *Hausskneht 333* (G-BOIS, JE, MSB, W) – (Assyria orient.): In montis Kuh-Sefin (ditionis Erbil), 1100–1200 m, 2.5.1893. *Bornmüller 1177* (B, MSB, W) and *1177b* (B) – Kurdestania, Riwandous ad fines Pers., in monte Hanoaru, 1300 m, 28.7.1893, *Bornmüller 1178* (B).

Iran. Prov. Tehran: Teheran, hinter Deschon-tepe, 10.5.1909, *Bruns* (B). – Prov. Kordestan: Sanandaj/Marivan, 16.6.1956, *Sabeti 21* (W) – In quercetis 90–110 km W Sanandaj versus Marivan (Dezh Shahpur), 1650–1800 m, 6.7.1971, *Rechinger 42914* (W) – 95 km from Marivan to Sanandaj, 1700 m, 5.7.1971, *Termeh 40929* (W) – 75 km NW of Sanandaj towardss Marivan, 1830 m, 18.5.1966, *Archibald 2030* (W) – Sanandaj to Marivan, Pass Ariz 25 km from Sanandaj, 2200–2350 m, 3.7.1971, *Termeh 41025* (W) – In jugo Ariz 20 km W Sanandaj, 2200 m, 4.7.1971, *Rechinger 42861* (W) – dto., *Lamond 4505* (M) – 15 km from Sanandaj on the road to Saghez, 1500 m, 7.7.1994, *Chehregani & Zarre 17854* (M, TARI, TUH) – Sanandaj, Areman, 20.5.??, *Sharif 5238* (W) – Sanandaj, 1700–2000 m, 26.5.1963, *Jacobs 6702* (BG, W) – Inter Kermanshah et Sanandaj, 120 km NNW Taqi Bustan, 29.8.1957, *Rechinger 14702* (W) – C. 100 km N of Kermanshah by the last pass before Sanandaj, 1700 m, 12.6.1959, *Wendelbo 1948* (BG, LE) – 86 km N of Kermanshah, inter Kermanshah et Sanadaj, 19.5.1960, *Bent & Wright 519-604* (W). – Prov. Kermanshah: mons Ghaladjeh, 2000 m, 15.5.1948, *Behbudi 155* (W). – Prov. Hamadan: Razan to Avaj, 10 km to Avaj, on the neck, 2200–2300 m, 10.7.1994, *Chehregani & Zarre 17883* (MSB, TARI, TUH). – Prov. Fars: Kuh-Tscha-Siah bei Siwend, 16.7.1885, *Stapf 1073* (WU, B).

Long calyx teeth and long hairs on the calyx characterize this species. The flowers are also relatively larger than in other species of the group. Like in *A. chrysostachys* the bracts fall very quickly. In some specimens of *A. nervistipulus* it is difficult to recognize the colour of the corolla after drying. Such specimens can be confused with *A. chrysostachys*, because the stipules of the latter are also thinly membranaceous and hyaline. In this case the long hairs on the calyx and long calyx teeth can lead to correct determination.

This species is remarkably disjunct: Beside the continuous area there is only one specimen known from mountains near Tehran, which has been described as *A. brunsianus*, and only one specimen known from Prov. Fars, which has been described as *A. chrysostachys* subsp. *dolichochorus*. The nearest locality from the collecting site near Tehran is Avaj in Prov. Hamadan, which is 200 km away. Between these two localities there are few high mountains, which are suitable for the growth of the species. Possibly if this region would be collected more intensively, the species could be found here, too. The same is true for the specimens from Prov. Fars. Here the region between Prov. Kermanshah and Prov. Fars, including Prov. Ilam and Prov. Kohgiluyeh is undercollected up to now.

13. ***Astragalus paralurges*** Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 67. 1868 et l.c. 15(1): 111. 1869. **Holotype**: Persia bor., inter Chorum-derreh et Sultanieh, 6.6.1859, *Bunge & Bienert* (P!; Iso: G-BOIS!).

Fig. 3 a

Plants 5–10 cm high, up to 20 cm including inflorescence. Hairs 0.1–0.8 mm, on the peduncle up to 2(–3) mm, on the calyx up to 5 mm long, mostly strongly appressed, longer ones thicker. Stems prostrate to ascending, 0.5–8 cm long, growing 0.5–3 cm per year, in first year 1–2 mm in diameter. Stipules thinly membranaceous, hyaline at free portion, older ones often deflexed and wrinkled, whitish yellow, with 3–5 parallel

nerves at upper portion, 4–9 mm long, at a length of 2–4 mm adnate to the petiole, otherwise 0.5–2 mm connate, oblong-lanceolate, acute or acuminate, ciliate, glabrous. Leaves 0.5–3.5 cm long; rachides very dense, thin, rigid, mostly recurved and deflexed, densely appressed hairy; petiole 1/4–1/3 the length of the rachid; end-thorn 1/2–1 time as long as the uppermost leaflets; leaflets in 2–5 pairs, silvery-green, strongly complicate, 3.5–12 mm long and 1–2.5 mm wide, linear to narrowly oblong, acute, with a mucro up to 0.5 mm long, both sides densely shortly sericeous. Inflorescence overtopping the leaves; flowering part lax, with remote flowers, 3–8 cm long and 2–3 cm in diameter; peduncle often longer than leaves, 3–6 cm long, densely to sparsely covered with appressed short (up to 0.7 mm long) and long (up to 3 mm long) hairs, longer hairs sometimes patent. Bracts very soon falling away, thinly membranaceous, hyaline, whitish yellow, purple at tip, broadly ovate at the base of the inflorescence to lanceolate-elliptic further up, 8–15 mm long and 3–6 mm wide, glabrous, sometimes sparsely ciliate. Calyx creamy with purple nerves and teeth, with 12–17 parallel nerves, 11–16 mm long and 3–4 mm wide, tubular, only slightly inflated at fruiting time to tubular-elliptic, sparsely villose; teeth 6–8 mm long. Corolla limb red, violet to dark purple. Standard 15–22 mm long; limb 10–15 mm long and 6–8 mm wide, elliptic to oblong-panduriform, at middle or lower third constricted, round tipped, minutely mucronulate, at the base sharply hastate; claw 5–7 mm long, broadly cuneate. Wings 13–18 mm long; limbs 6–9 mm long and 2.2–3.5 mm wide, narrowly oblong, obtuse or rarely slightly acuminate; auricle 0.2–0.6 mm long; claw 7–9.5 mm long. Keel 12.5–17 mm long; limbs 5–6 mm long and c. 3 mm deep, oblong or triangular-obovate, with almost rectangular bent lower edge and concave upper edge, obtuse, minutely mucronulate; auricle distinct; claw 7.5–11 mm long. Stamens at upper (3–)4–5 mm free from each other. Fruit 5–7 mm long, 1.5–2 mm high and 3–4 mm wide. Seeds olive-green to dark brown, sometimes with sparse black spots, 4–4.5 mm long and 2–3 mm wide, elliptic, flattened, at first smooth becoming rugose.
Flowering and fruiting time: VI–VII.
Distribution: W and NW Iran. Map 6.

Specimens seen:

Iran. Prov. W Azarbaijan: c. 5 km SW of Tekab, 2400 m, 5.6.1974, *Wendelbo et al. 12240* (LE, W) – Bonab to Chaftan, 1500–1950 m, 7.6.1977, *Moussavi & Tehrani 36817* (W). – Prov. Kordestan: Bijar, Kuh-e Hamzeh Arab, 2000–2600 m, 31.6.1971, *Termeh 40786, 40928* (W) – In monte Hamzeh Arab SE Bijar, 2200–2600 m, 1.7.1971, *Lamond & Termeh 42576* (W) – Bijar to Sanandaj, 72 km to Sanandaj, 1950 m, 1.7.1971, *Termeh 40785* (W) – In saxosis et ad versuras 47 km W Bijar versus Divandarreh, 2000 m, 2.7.1971, *Rechinger 42679* (W). – Prov. Kermanshah: 15 km NW Songhor, 13.6.1959, *Pabot 1824* (M). – Prov. Zanjan: Persia bor., inter Chorum-derreh et Sultanieh, 6.6.1859, *Bunge & Bienert* (G-BOIS, P). – Prov. Hamadan: Aq Bulaq, c. 100 km N Hamadan, 15.6.–1.7.1960, *Rioux & Golvan 306* (W).

A. paralurges differs from other species of the section in having very short leaves, lax inflorescence and a scarcely inflated fruiting calyx. Some populations of *A. rubrostriatus*, which is the closest relative of the former, also have lax inflorescence and sometimes a tendency to have short leaves. The following table can be used to distinguish the two species:

Character states in *A. rubrostriatus*	Character states in *A. paralurges*
rachides mostly straight	rachides mostly recurved
stipules whitish	stipules yellowish
leaflets mostly longer than 10 mm	leaflets 4–10 mm long
calyx 5–8 mm wide at fruiting time	calyx 3–4 mm wide at fruiting time

14. ***Astragalus pedicularifórmis*** Maassoumi, Iran. J. Bot. 6(2): 208. 1995. **Holotype**: Iran: Prov. Zanjan, Soltanieh, Arjin village, Kuh-e Sheikh-Serri, 2100–2250 m, 2.7.1991, *Ranjbar et al. 69603* (TARI!).

Fig. 5 b

Plants 15–20 cm high. Hairs 0.1–1 mm, on peduncle up to 2 mm and on calyx up to 4 mm long, mostly thin, longer ones somewhat thicker. Stems from a prostrate base ascending, up to 12 cm long, growing 0.5–5 cm per year, in first year 1–2.5 mm in diameter. Stipules thinly membranaceous, hyaline, yellowish, with 5–8 parallel nerves at free portion, 12–20 mm long, at a length of 7–10 mm adnate to the petiole, otherwise 1.5–4 mm connate, triangular to lanceolate, acuminate, glabrous or younger ones pilose only at the base, ciliate. Leaves 3–11 cm long; rachides dense, rigid, thick, straight oblique to subhorizontal, rarely curved, sparsely appressed shortly hairy, glabrescent; petiole 1/6–1/4 the length of the rachid; end-thorn 1/3–1/1 of the length of the uppermost leaflets; leaflets in 4–7 pairs, remote, light to dark green, flattened or slightly complicate, 5–15 mm long and 1.5–4 mm wide, narrowly oblong-elliptic, acute, with a mucro up to 2 mm long, both sides sparsely appressed hairy, glabrescent. Inflorescence not overtopping the leaves; flowering part ± dense, 3.5–6 cm long and 3–3.5 cm wide; peduncle 0.5–6 cm long, densely appressed villose. Bracts thickly membranaceous, yellowish white, hyaline at margins, purple at tip, 8–16 mm long and 2.5–6 mm wide, ovate-elliptic, long acuminate, glabrous or sparsely appressed pilose on the midrib. Calyx whitish or creamy, red at the teeth, at first tubular, later on ovate-elliptically inflated, 11–15 mm long and 4–8 mm wide, with 17–25 parallel nerves, densely appressed hairy, becoming sparsely villose; teeth 4–7 mm long. Corolla limb dark purple. Standard 13–18 mm long; limb 7.5–12 mm long and 5–7 mm wide, oblong-panduriform, obtuse or rarely retuse at tip, sometimes minutely mucronulate, sharply hastate at base; claw 4–8 mm long, broadly cuneate. Wings 13–17 mm long; limbs 6–8.5 mm long and 2.5–3 mm wide, narrowly oblong, obtuse; auricle 0.3–0.6 mm long; claw 7.5–9.5 mm long. Keel 11.5–15 mm long; limbs c. 5 mm long and 2–3 mm deep, obovate-triangular to ± oblong, with almost rectangular curved lower edge and straight or ± convex upper edge, obtuse, minutely mucronulate; auricle minute; claw 7.5–10 mm long. Stamens at upper 3–5 mm free from each other. Fruit and seeds unknown.
Distribution: NW Iran. Map 6.

Specimens seen:

Iran. Prov. Zanjan: Soltanieh, 7 km to Soltanieh from Gheydar (Qeydar), 1850 m, 2.7.1974, *Alava 14178* (TUR) & *Termeh & Moussavi 40920* (W) – Soltanieh, Arjin village, Kuh-e Sheikh-Serri, 2100–2250 m, 2.7.1991, *Ranjbar et al. 69603* (TARI).

This newly described species is known only from one locality about Sultanieh in Prov. Zanjan (Iran). However, the glabrous bracts, glabrescent leaves and thinly membranaceous stipules are so characteristic that we have not any doubt to accept it

as a good one. The above mentioned characters separate it from its next relatives namely *A. tabrizianus*. Such locally endemics are not rare in the sect. *Hymenostegis*.

In the original description the size of the standard was cited as 18–24 mm, but this is certainly a mistake.

15. ***Astragalus persicus*** (DC.) Fisch. & C.A.Mey., Ind. Sem. Hort. Petrop. 1: 3. 1835 ≡ *A. lagopoides* Lam. var. *persicus* DC., Prodr. 2: 299. 1825 ≡ *A. olivieri* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 69. 1868 et l.c. 15(1): 115. 1869 ≡ *A. mesopotamicus* Boiss. var. *olivieri* (Bunge) Boiss., Fl. Or. 2: 381. 1782. **Holotype**: inter Kermancha et Amadan [inter Kermanshah et Hamadan], *Olivier & Bruguière* (P!).

= *A. mesopotamicus* Boiss., Diagn. Pl. Or. Nov. 2: 68. 1843. Holotype: Mesopotamia, *Aucher 1275* (G-BOIS!; Iso: G!, P!).

= *A. bounophilus* Boiss. & Hohen. in Boissier, Diagn. Pl. Or. Nov. 9: 99. 1849 ≡ *Tragacantha bounophila* (Boiss. & Hohen.) Kuntze, Revis. Gen. 2: 943. 1891. Holotype: Syach Nala [Palas] ad radice montis Demawend prope Lar, 13.6.1843, *Kotschy 313* (G-BOIS!; Iso: G!, GOET!, H!, LE!, M!, P!, REG!, TUB!, W!: foto MSB!, WAG!).

= *A. kapherrianus* Fisch., Bull. Soc. Imp. Naturalistes Moscou 26(2): 446. 1853. Lectotype (here designated): Persia bor. Prov. Ghilan, *Kapherr* (LE!: sub *A. persicus*).

= *A. rubriflorus* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 67. 1868 et l.c. 15(1): 109. 1869 ≡ *Tragacantha rubriflora* (Bunge) Kuntze, Revis. Gen. 2: 947. 1891. Lectotype (here designated): Elbrus prope Assad-bar, 14.7.1843, *Kotschy 524* (P!; Iso: BM!, G-BOIS!, LE!, PRC!, W!).

= *A. seidabadensis* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11 (16): 68. 1868 et l.c. 15 (1): 113. 1869 ≡ *Tragacantha seidabadensis* (Bunge) Kuntze, Revis. Gen. 2: 948. 1891. Holotype: Persia bor.-occ., Seid-abbad prope Tabris, VI.1859, *Bunge & Bienert* (P!; Iso: G-BOIS!, GOET!, LE!, M!, P!, W!, MSB!)

= *A. naftabensis* Sirj. & Rech.f., Ann. Naturhist. Mus. Wien 58: 69. 1951. Holotype: Persiae Prov. Mazanderan, Distr. Nur, inter Kamarband et jugum Naftab, 3200 m, 8.8.1948, *Rechinger 6465* (W!: foto MSB!; Iso: B!, G!, K!, LD!, M!).

= *A. manucherii* Sirj. & Rech.f., Ann. Naturhist. Mus. Wien 58: 70. 1951. Holotype: Mazanderan, Distr. Nur, inter Kamarband et minas carbon. Elika, 3000 m, 8.8.1948, *Rechinger & Manucheri 6410* (W!: foto MSB!; Iso: B!: foto MSB, G!).

= *A. naftabensis* Sirj. & Rech.f. var. *brevipedunculatus* Sirj. & Rech.f., Ann. Naturhist. Mus. Wien 58: 70. 1951. Holotype: Persia, Prov. Mazanderan, in jugo Kandavan, 2600–3000 m, 25.8.1948, *Rechinger 6738* (W!: foto MSB).

= *A. dianat-nejadii* F. Ghahremani., Iran. J. Bot. 5: 106. 1993 (1992). Holotype: Iran, Azarbayejan, Ahar to Kaleibar, protected area of Arasbaran, 1550 m, 8.7.1991, *F. Gharemani-Nejad & Zarre 69611* (TARI!; Iso: Herb. Univ. Tarbiat-Moallem).

= *A. capax* Maassoumi, Iran. J. Bot. 6(2): 202–203. 1995. Holotype: Iran, Prov. Tehran, S slope of Damavand mt., 3300–3800 m, 26.6.1988, *Khatamsaz et al. 64734* (TARI)

= *A. expetitus* Maassoumi, Iran. J. Bot. 6(2): 204–205. 1995. Holotype: Iran, Prov. E Azarbaijan, ca. 5 km SW Tekab, 2400 m, 5.6.1974, *Wendelbo et al. 12223* (TARI; Iso: W!)

= *A. ferruminatus* Maassoumi, Iran. J. Bot. 6(2): 206. 1995. Holotype: Iran, Prov. Ilam, Shahabad road, 1510 m, 27.7.1965, *Seraj 24706* (TARI)

= *A. leptynicus* Maassoumi, Iran. J. Bot. 6(2): 207. 1995. Holotype: Iran, Semnan, Semnan to Firuzkuh, 33 km NW of Semnan, 2450 m, 24.6.1974, *Wendelbo & Foroughi 13014* (TARI; iso: LE!, W!)

Figures: KOMAROV, Fl. USSR 12: 433, pl. XXIX, nr. 2, 1946; F. GHAHREMANI, Iran. J. Bot. 5: 107. 1993 (1992) (as *A. dianat-nejadii*).
Fig. 6 a–d

Plants 10–50 cm high. Hairs 0.1–1.5 mm, on peduncle up to 2.5 mm, on the calyx up to 5 mm long, thin, longer ones somewhat thicker, sharply ending. Stems from a prostrate base ascending, up to 15 cm long, in first year 1–3.5 mm in diameter, growing 0.5–5 cm per year. Stipules chartaceous, yellowish, 7–26 mm long, at a length of 3–14 mm adnate to the petiole, otherwise 1–7 mm connate, triangular-lanceolate, acuminate or rarely acute, sometimes two tipped, with 5–8 parallel nerves at free portion, glabrous, ciliate or not. Leaves 1–20 cm long; rachides dense, mostly thick, rigid or rarely flexible, straight or curved, oliquely erect to deflexed, older ones mostly broken, densely or sparsely covered with appressed or spreading hairs; petiole 1/4–1/2 the length of the rachid; end-thorn 1/8–1/1 the length of the uppermost leaflets; leaflets in 3–10 pairs, dense or remote, greyish green to green, 4–30 mm long and 1.5–7 mm wide, narrowly oblong-elliptic or rarely ovate, mostly flattened, obtuse or acute, with a mucro of 0.4–1.5 mm long, both sides densely sericeous to spreadingly hairy, glabrescent. Inflorescence higher or rarely shorter than the leaves; flowering part very dense 3.5–11(–15) cm long and 2.5–3.5(–4) cm wide, ovate to long cylindrical or rarely globose; peduncle 0.5–24 cm long, shorter to longer as the leaves, densely covered with short appressed and between them some longer, thicker and subappressed hairs, or densely villose. Bracts thinly membranaceous to glumaceous, sometimes hyaline towards margins, pale yellow to greyish, rarely purple at tip, 8–27 mm long and 3–10 mm wide, broadly ovate to lanceolate-elliptic, shortly or long acuminate, ± densely pilose at whole surface or only on the midrib and apex hairy or wholly glabrous, ciliate or not. Bracteoles rarely present, thinly membranaceous, yellowish white, c. 4 mm long and up to 1.5 mm wide, glabrous. Calyx creamy, with red teeth and nerves at least towards the teeth, tubular at first, soon becoming globosely, ovately to elliptically inflated, 10–18 mm long and 3–8 mm wide, with 17–26 parallel nerves, densely appressed long hairy becoming villose; teeth 3.5–8 mm long. Corolla limb pink to red or purple, rarely white to pale yellow sometimes turning to brown in drying state. Standard 13–23(–25) mm long; limb 7.5–15 mm long and 5–8 mm wide, oblong-panduriform, retuse at tip, sometimes minutely mucronulate, sharply hastate at base; claw 6–8 mm long, broadly cuneate. Wings 13–20 mm long; limbs 5.5–8 mm long and 1.5–2.8 mm wide, narrowly oblong, obtuse; auricle 0.3–1 mm long; claw 7.5–12 mm long. Keel 11.5–17 mm long; limbs 4.5–6 mm long and 2–3 mm deep, obovate-triangular or rarely elliptic, with ± rectangular or rarely broadly curved lower edge and straight or convex upper edge, obtuse, sometimes minutely mucronulate; claw 6.5–11 mm long. Stamens at upper 2.5–5 mm free from each other. Fruit 4–7 mm long, 1–1.5 mm high and 2–4.5 mm wide. Seeds light to dark brown, sometimes with black spots, 3–5 mm long and 2–3.5 mm wide, elliptic to broadly elliptic, pitted.
Flowering and fruiting time: V–VIII.
Distribution: Azerbeidzhan, W, N Iran. Map 7.

Specimens seen:
1. Typical specimens of *A. persicus*:

Azerbeidzhan. In collibus aridis arenosis Swant, Georg. cauc. 4000–6000 ft, VI.–VII.1836, *Hohenacker* (G-BOIS, M, W) – In montibus Taliisch, prope pag. Swant, *C.A. Meyer1267* (G-BOIS, LE, W).

Iran. Prov. Tehran: Gajereh, 2650 m, *Amin 16101* (W) – Montes Elburz: In saxosis calc. inter Shemshak et jugum Dizin, 2900 m, 25.6.1977, *Rechinger 57191* (W) – Dizin, Pey-

Kamar, 2650–2750 m, 22.6.1982, *Moussavi et al. 41126* (W) – Alborz: Gajereh, Dizine, 2400–2600 m, 12.7.1977, *Termeh & Matine 36734* (W) – Alborz, valle de Taleghan, 3050 m, *Klein 2988* (W) – M.Elburs occid., Warwatche, 3700 m, *Klein 4032* (W) – Talagan, 1280 m, 12.7.1972, *Mirfakhraty 15872* (W) – Barry ditionis Asadbar, 2800 m, 26.6.1902, *J. & A. Bornmüller 6873* (B, W) – Elbursgebirge, N vom Kendewan pass, 2970 m, 5.7.1936, *Gilli* (W) – dto. c. 2700–3000 m, *Rechinger 2114* (B, W) – E du col de Kandavan, 2900–3050 m, 26.7.1960, *Pabot 4477* (MSB, W) and *1279* (W) – Elburz mts., above the Kandevan pass, 3200 m, 25.6.1966, *Archibald 2497* (W) – In declivibus australibus jugi Kandavan, 2400 m, 25.6.1975, *Renz 53797* (W) – In regione subalpina alpium Totschal, in latere boreali, 2400 m, 11.6.1902, *J. & A. Bornmüller 6871* (B) – Teheran, in declivibus ad pedem montium Elburz supra vicum Darband et declivia montis Kuhha-ye Touchal, 2000–3800 m, 29.6.1977, *Sojak 6940* (PR) – Elbursgebirge, Ufer des Tarsees, 2810 m, 15.7.1936, *Gilli* (W) – Elburs, ad Haki, inter Dschoistan et Hazartschal, 3000 m, 28.6.1902, *J. & A. Bornmüller 6873b* (B) – m. Elburs occid., in subalpinis vallis fluvii Dschadscherud, prope Schekerabad, 2200 m, 26.6.1902, *J. & A. Bornmüller 6884* (B) – 30' NE Tehran, 10000 ft, 11.7.1962, *Furse 3163* (W) – Keredj, Hesarband (dit. Getschar), 2400 m, 10.7.1953, *Gauba 453* (B) – Gatchsar to Gadjereh, Varang-road to Sorkhab, 2240–2450 m, 9.7.1977, *Termeh & Matin 36749* (W). – Prov. Markazi: 55 km from Arak to Malayer (UT3), 2100 m, 15.6.1984, *Mozaffarian & Maassoumi 48080* (MSB). – Prov. Mazandaran: Elika, Kamarbon, Kuh-e Varvasht, 3200–3650 m, 13.–14.7.1980, *Termeh et al. 39828* (W) – Kalardasht, Pit-sara to Sarchal, 2700–3600 m, 9.8.1972, *Termeh 40991* (W) – Koudlar, Amarlou (montis), 8.7.1966, *Mir-Kamali 6933* (W) – Elborz: Elika, Makliz (montis), 2400–3400 m, 3.8.1972, *Termeh 15230* (W) – Larijan, Khommeh, 10 km W of Rineh, 2900 m, 21.7.1980, *Moussavi et al. 39861* (W) – pentes sud du Kuh-i Demavend, 2000–3500 m, 18.–20.7.1956, *Schmid 6409, 6410* (G, W) & *6401* (G) – 23 km from Abe-Ali to Polur, 2350 m, 18.7.1972, *Dini & Arazm 15556* (W) – Polur-Tehran, Abali, 2350 m, 17.6.1972, *Babakhanlu & Amin 15767* (W) – Karimserai, 9000 ft, 20.7.1940, *Koelz 16499* (US, W) – ad basin montis Demawend, supra Pelur, 2300 m, 15.7.1902, *J. & A. Bornmüller* (B, LE, W) – Lar valley, 2500 m, 3.7.1974, *Wendelbo and Assadi 13423* (W) – Demawend, in reg. infera supra Lar, 2700 m, 17.7.1902, *J. & A. Bornmüller 6867* (B) – Lar, 2500 m, 19.7.1972, *Dini & Arazm 15710* (W) – Kharsang, Darreh-e Lar, 1900 m, 22.7.1972, *Dini & Arazm 15991* (W) – Polur, Gozal-darreh, 2380–2500 m, 10.7.1982, *Termeh et al. 41128, 41135, 41136* (W) – In collinis Syach Palas valle Laar, prope Damawent, 19.6.1843, *Kotschy 335* (LE, W). – Prov. Gilan: Inter Diardschan et Kilischin, 22.7.1902, *Alexeenko 1029* (LE). – Prov. E Azarbaijan: In latere occidentalis montium Talysh in valle Ambrani, Ardebil versus, 24.6.1880, *Radde* (LE) – 5 km SW of Tekab, 2400 m, 5.6.1974, *Wendelbo et al. 12223* (W) – Ardebil: 42 km to W. Nohour, Lisar, protected area, 2540 m, 23.7.1974, *Foroughi & Assadi 13805* (W) – Sarab, Asbforonshan, 2100 m, 25.7.1970, *Izadyar 14652* (W) – In argillosis 52 km a Siah Chaman versus versus Maragheh, 1600–1750 m, 14.6.1977, *Rechinger 56713* (W). – Prov. Kordestan: Divan Dareh, Sarab, 2150 m, 4.7.1968, *Iranshahr 13273* (W) – Bijar to Sanandaj, 60 km to Sanandaj, 2000 m, 1.7.1971, *Termeh 41002* (W) – prope Hoseynabad, 50–60 km N Sanandaj, 2000 m, 2.7.1971, *Rechinger 42733* (W) – In jugo prope Salavatabad 25 km E Sanandaj, 3.7.1971, *Rechinger 42811* (W) – Prov. Kermanshah: Sungur, in m. Kuh Emrallah, 3.6.1902, *Strauss* (B, W) – ca. 120 km S Kermanshah, route de Kermanshah-Ilam, 27.6.1965, *Seraj SJ VII e/8* in hb. PABOT (G). – Prov. Hammadan: 40 km NW of Hamadan, 28.6.1965, *Ledingham, Zohary et al., 4255* (LE, W) – am Elwend bei Haydare, 6.6.1882, *Pichler* (B, W) – In m. Elwend, VIII.1898, *Strauss* (B) – In dit. urb. Hamadan, montes Karaghan, VII.1899, *Strauss* (B). – Prov. Lorestan: Azna, 1800 m, 9.6.1937, *Köie 1276* (B, C, W) – Bordsch, 2200 m, 18.6.1937, *Köie 1268* (B, C, W). – Prov. Semnan: 45–52 km Shahmirzad towardss Fulad-Mahalleh, 2200–2300 m, 9.7.1974, *Renz & Iranshahr 16733* (W) – 90 km Semnan vers Sari, Parvar (région protégée), Kuhha-ye Kolurd, 2180–2320 m, 10.8.1978, *Termeh et al. 39424* (W) – Elburz mts.: Nezva Kuh area: Shahmirzad (Bashm) kuh, 2300 m, 10.7.1959, *Wendelbo 1323* (BG, LE, W) – Shahmirzad, Kuh-e Nizva, 2800 m, 1.8.1972, *Iranshahr & Zargani*

15206 (W) – 35 km from Semnan to Shahmirzad, Fulad Mahalleh, 2350–2500 m, 9.7.1074, *Rense & Iranshahr 16725* (W) – Semnan to Firuzkuh, 33 km NW of Semnan, 2450 m, 24.6.1974, *Wendelbo & Foroughi 13014* (LE, W) – Parvar, Protected Region: In montibus inter Shahmirzad, et Fulad Mahalla, 68 km NE Semnan, 2200 m, 30.5.1975, *Rechinger 52335* (W).

2. Specimens with bracts longer than calyx:

Iran. Prov. Tehran:Alamut, Hyle road, 2100 m, 6.6.1973, *Babakhanlu & Amin 15080* (W) – Akbarabad, Alamut, 2000 m, 7.7.1973, *Babakhanlu & Amin 15632* (W) – Pass between Qazvin and Manjil, 1500 m, 13.7.1975, *Wendelbo & Assadi 18291* (W) – Sirachal, Karaj-Chalus, 1980 m, *Babakhanlu & Amin 16059* (W) – Khargushdarreh, Karaj-Chalus, 2450 m, 24.6.1973, *Babakhanlu & Amin 16092* (W) – In valle Talagon prope Gattade, 14.7.1843, *Kotschy 522* (G-BOIS, W) – dto., 2300 m, 27.6.1902 and 1.7.1902, *J. et A. Bornmüller 6882* & *6881* (B, W) – ad Gerab in valle Talkan, 2300 m, 26.6.1902, *J. et A. Bornmüller 6883* (B) – Ad pagum Deda districtus Talkan, 2350 m, 1.7.1902, *J. et A. Bornmüller 6885* (B) – M. Elburs occid., ad Getschsar, in valle Lur, 2200 m, 20.6.1902, *J. et A. Bornmüller 6887* (B, LE, ZT) – Karadj, Asara, Sepahsalar, 5.7.1968, *Termeh & Izadyar 40793* (W) – Elburz mts., Kandavan region, S side, 2700–2900 m, 5.7.1974, *Wendelbo & Cobham 13460* (W) – dto., 2700–3800 m, 8.7.1977, *Sojak 7763* (W) and*7770* (PR) – Tehran, Shemshak, 1.7.1966, *Kashkouli 40922* (W). – Prov. Mazandaran: E of Demavand, Rene, 8000 ft, 22.6.1965, *Ledingham 4175* (LE, W) – Elika to Varvasht, 2500–3200 m, 15.7.1980, *Termeh et al. 40841* (W).

3. Low cushion forming forms with densely branched stems, hyaline bracts and stipules, consistent with the type of *A. manucherii*:

Iran. Prov. Mazandaran: Nour, Kalej, Neli-Pashteh,Kouha-ye Sardabeh, 8.7.1982, *Termeh et al. 41129* (W) – 4 km S of Reyneh, on E slope of mt. Demavand, 2200 m, 27.7.1964, *Grant 16,516* (W). – Prov. Tehran: Inter Djabun et Firuzkuh, c. 2200 m, 29.6.1937, *Rechinger 1154b* (W) – Road of Ab-Ali to Plur, 1350 m, 18.7.1972, *Dini & Arazm 15707* (W) – 10 km NE Firuzkuh, 10000 ft, 29.6.1962, *Furse 2951* (E,) – 16 km E Firuzkuh, 1950 m, 23.6.1972, *Babkhanlu et al. 15822* (W). – Prov. Semnan: Elburz mts.: Nezva Kuh area: N side of Shahmirzad (Bashm) Kuh, 2200 m, 10.7.1959, *Wendelbo 1301* (BG, W) – S des Kuh-i Nizwa: Im Tal von Sar-lasch, 2350 m, 31.7.1948, *Behboudi & Aellen 1041* (G-Aellen) – Oberlauf des Kuh-i Nizwa, Berghang neben Djashm (Tschafte) 2200 m, 27.7.1948, *Behboudi & Aellen 5601* (G-Aellen, W).

A. persicus is the most variable species in the section. Shortly pedunculate forms of it were named *A. rubriflorus* or *A. naftabensis* var. *brevipedunculatus*, specimens with thin and flexible rachides and short flowers were called *A. bounophilus*, long bracteate forms were named *A. lagurus* var. *virescens* (nom. nud.), and specimens with hyaline stipules and bracts were known as *A. manucherii*. After many field studies and revising all the herbarium material, we concluded that there are no exact limits between these forms. The many intermediates make it necessary to unite all these forms into one species. Moreover, in some regions such as Lar valley near Damawand mountain (N Iran) all of the forms can be seen together. Although the extreme forms seem to be very different from each other, the range of variation in most characters is absolutely continuous.

The indumentum is also very variable. The rachides, leaflets and peduncles can be appressed hairy or tomentose. The length of hairs varies extensively in different forms. But, interestingly, forms with short peduncles have mostly shorter hairs on it, and so they can be separated from similar forms of *A. hirticalyx*.

Another problem is the extreme variability in size of the bracts, their texture and indument. The bracts are in some forms even longer than those of *A. lagopoides* and therefore these forms can be confused with the latter. Fortunately these morphs occur only in a limited region about Tehran, which is relatively far from the main area of *A. lagopoides*. Moreover, such specimens of *A. persicus* have patent hairy rachides and peduncles and tomentose leaflets, in difference to *A. lagopoides*, whose vegetative parts are always appressedly hairy. The long bracteate forms of *A. persicus* have mostly purple tipped bracts, whereas purple tipped bracts are very rare in *A. lagopoides*.

Forms of *A. persicus*, which coincide the type of *A. bounophilus* (with thin, flexible and recurved rachides and ± globose inflorescence) occur also in western part of Iran at the border to Iraq where they were named *A. mesopotamicus*.
The following collection: Prov. Khorasan: Chehel dokhtar, Deh-sefid towards Dasht-aheh (protected region), 1550 m, 23.7.1975, *Moussavi & Karavar 33601* (W), is closely related to *A. persicus* but differs from it in having a larger corolla, which is shorter or as long as the calyx. Moreover, the inflorescence of it is wider than in *A. persicus* (more like in *A. glumaceous*). This is surely a representative of a new taxon, but more material is needed for an exact decision.

Colour of the flowers is also variable in this species. Two different populations with white (by drying changed to yellow) flowers are known to us: One of them occures in NW Iran in Arasbaran protected region (described as *A. dianat-nejadii*), and the second one in southern part of province Kermanshah towards Ilam (SW Iran) which was described newly by MAASSOUMI (1995) as *A. ferruminatus*. Both species were compared with the yellow-flowered species *A. chrysostachys* in original descriptions, but according to their thickly membranaceous and hairy bracts, these white-flowered plants belong clearly to *A. persicus* and not to yellow-flowered *A. chrysostachys* with hyaline and glabrous bracts. Specimens with white (or yellow) flowers can be found also in populations with red or purple flowers. The collection *Wendelbo & Assadi 13423* is an example for this. It was collected in Lar valley (near Damavand-Iran), where most of specimens of *A. persicus* have pink to red flowers.

See also the notes of *A. chrysostachys* and *A. hirticalyx*.

16. *Astragalus recognitus* Fisch., Bull. Soc. Imp. Naturalistes Moscou 26(2): 452. 1853 ≡ *Tragacantha recognita* (Fisch.) Kuntze, Revis. Gen. 2: 947. 1891. **Holotype**: In ditione Rescht, a PRESCOTT communicavit, fortasse *Aucher* [*4403* ?] (LE!: a PRESCOTT communicavit; Iso: G!: no. *4403*, G-BOIS!, P!, W!).

Fig. 4 b

Plants 10–20 cm high. Hairs yellow, 0.1–2 mm, on the calyx up to 4 mm long, mostly very thin, straight. Stems prostrate to ascending, up to 10 cm long, growing 0.5–2 cm per year, in first year 1–3 mm in diameter. Stipules chartaceous, yellowish, not hyaline, with 8–13 parallel nerves in upper portion, 7–20 mm long, at a length of 4–10 mm adnate to the petiole, otherwise up to 1–2 mm connate, from a narrow triangular base acuminate, glabrous, ciliate. Leaves 1.5–9 cm long; rachides dense, ± thin, rigid, obliquely erect to recurved, densely covered with appressed hairs, becoming tomentose; petiole 1/3–1/2 the length of the rachid; end-thorn 1/4–1/2 the length of the uppermost leaflets; leaflets in (2–)3–7 pairs, ± dense, yellowish-green to silvery-green, ± flattened, 5–12 mm long and 2–4 mm wide, narrowly oblong to narrowly elliptic, obtuse, with a mucro up to 1.5 mm long, both sides densely covered with appressed long straight hairs. Inflorescence slightly overtopping the leaves; flowering part dense, 4–8 cm long and c. 3 cm in diameter; peduncle thick, shorter or

as long as the leaves, 3–9 cm long, densely appressedly hairy. Bracts chartaceous, not hyaline, yellow, sometimes pink-tipped, lower ones mostly falling away, 8–14 mm long and 3–8 mm wide, broadly ovate to lanceolate-elliptic, acuminate, sparsely appressed pilose all over or only at midrib and apex, ciliate. Calyx yellow to light orange, sometimes with purple teeth, with 25–30 parallel nerves, at first tubular, soon becoming elliptically or globosely inflated, 13–18 mm long and 5–10 mm wide, ± densely long appressed hairy becoming sparsely villose; teeth 5–8 mm long. Corolla pale yellow. Standard 16–24 mm long; limb 10–16 mm long and 7–9 mm wide, oblong-panduriform, obtuse or slightly retuse at tip, minutely mucronulate, sharply hastate at base; claw 6–8 mm long, broadly cuneate. Wings 15–20 mm long; limbs 7–8 mm long and 2–3 mm wide, narrowly oblong, obtuse; auricle 0.3–0.6 mm long; claw 8.5–13 mm long. Keel 13–17 mm long; limbs 5–6 mm long and 2.8–3 mm deep, triangular-oblong, with almost rectangular curved lower edge and ± straight upper edge, obtuse, minutely mucronulate; auricle very short; claw 8–11 mm long. Stamens at upper 3–4 mm free from each other. Fruit 8–10 mm long, 1.5–2.5 mm high and 2.5–3.5 mm wide. Seeds light to dark brown, ± flattened, 3–4.5 mm long and 1.5–2.8 mm wide, elliptic to broadly elliptic, pitted.
Distribution: NW Iran. Map 8.
Flowering and fruiting time: V–VII.

Specimens seen:

Iran. Prov. Gilan: In ditione Rescht, fortasse *Aucher* [*4403*] (G, G-BOIS, LE, P, W). – Prov. E Azarbaijan: In faucibus trachyt. ad radices montium Sabalan inter Ardabil et Meshgin Shahr, 25.5.1971, *Rechinger 40454* (W) – Sarab, Gharieh-ye Mir-Kouh-Hadji, 1700–1900 m, 11.–12.6.1986, *Termeh & Daneshpajuh 41361* (W) – Mianeh, Varzeghan, Sonly-Darreh, 1550–1920 m, 5.7.1983, *Moussavi,et al.41074* (W).

A. recognitus is closely related to *A. chrysostachys*, but differs from the latter in having thickly membranaceous bracts and stipules. As has been mentioned before (see the note of *A. persicus* about *A. dianat-nejadii*), some specimens of *A. persicus* also have white to pale yellow corollas. Fruiting specimens of the two species however are easy to separate: Fruits of *A. persicus* are up to 7 mm long and those of *A.recognitus* 8–10 mm long. Moreover, leaflets of the latter have a double indumentum of curled, short hairs and appressed straight longer hairs, a character, which is easily to see on lower leaf surface. The hairs of *A. recognitus* are yellowish in most of the specimens seen .

17. ***Astragalus rubrostriatus*** Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 68. 1868 et l.c. 15(1): 113. 1869 ≡ *Tragacantha rubrostriata* (Bunge) Kuntze, Revis. Gen. 2: 947. 1891. **Holotype**: Persia bor. occ., inter Mianeh et Sengan, inter Agh-Kent et Bagh, 7.6.1859, *Bunge & Bienert* (P!)
= *A. sciureus* Boiss. & Hohen. var. *tefreschensis* Bornm., Beih. Bot. Centralbl. 32(2): 374. 1914. Lectotype (here designated): In mte. Kuh-i-Gäsawend, 1.7.1909, *Strauss* (B!: foto MSB!; Iso: JE!).
= *A. pseudobrunsianus* Maassoumi, Iran. J. Bot. 6(2):209.1995. Holotype: Iran, Tehran, S of Tehran, Kuh-e Bibi Shahrbanou, 1350 m, 24.6.1973, *Basbakhanlou & Amin 15215* (TARI; Iso: W!).

Fig. 2 d

Plants 10–20 cm high, up to 30 cm including inflorescence. Hairs 0.1–0.8 mm, on the peduncle up to 2 mm, on the calyx up to 5 mm long, mostly strongly appressed, longer ones thicker than the remainder. Stems from a prostrate base ascending, 2–18 cm long, growing 0.5–4 cm per year, in first year 1–3 mm in diameter. Stipules thinly membranaceous, hyaline at free portion, whitish yellow, with 1–3 parallel nerves at free portion, 4–12 mm long, at a length of 2–7 mm adnate to the petiole, otherwise 1–3 mm connate, narrowly triangular, acute or acuminate, glabrous, ciliate or not. Leaves 0.5–8 cm long; rachides very dense, thin or thick, rigid, mostly straight, obliquely erect to subhorizontal or rarely deflexed, densely appressed sericeous; petiole 1/4–1/3 the length of the rachid; end-thorn 1/3–1/1 of the length of the uppermost leaflets. Leaflets in 3–7 pairs, dense, silvery-green to grey-green, strongly complicate or rarely flattened, 3.5–21 mm long and 0.5–5 mm wide, linear to narrowly oblong, acute, with a mucro up to 1 mm long, both sides densely to sparsely sericeous. Inflorescence overtopping the leaves; flowering part lax, with remote flowers, 5–15 cm long and 2–3 cm in diameter; peduncle as long or longer than the leaves, 3.5–10 cm long, densely to sparsely covered with appressed short hairs up to 0.7 mm and between them with some subappressed to patent ones up to 3 mm long. Bracts easily falling away, membranaceous, whitish yellow, oblong to broadly ovate at the base of the inflorescence to lanceolate-elliptic or narrowly oblong further up, 8–15 mm long and 2–8 mm wide, glabrous, or sparsely appressed pilose on midrib, ciliate. Calyx creamy with purple nerves and teeth, sometimes at upper part or wholly purple, with 15–24 parallel nerves, 11–16 mm long and 3.5–7 mm wide, at first tubular, becoming elliptically inflated, sparsely villose; teeth 5–7 mm long. Corolla limb pink to purple. Standard 16–23 mm long; limb 11–16 mm long and 7–10 mm wide, oblong-panduriform, in the middle or lower third constricted, shallowly retuse at tip, sometimes minutely mucronulate, sharply hastate at base; claw 4–7 mm long, broadly cuneate. Wings 13–20 mm long; limbs 6–9 mm long and 2.2–3 mm wide, narrowly oblong, obtuse at tip; auricle 0.2–1 mm long; claw 7–11.5 mm long. Keel 12–16 mm long; limbs 5–6 mm long and c. 3 mm deep, obliquely elliptic, with broadly curved lower edge and concave upper edge, obtuse; claw 6.5–10 mm long. Stamens at upper 4–5 mm free from each other. Fruit 4.5–6.5 mm long, 1.5–2 mm high and c. 3 mm wide. Seeds olive-green to dark brown, sometimes with few black spots, c. 4 mm long and 2–3 mm wide, elliptic, flattened, at first smooth becoming rugose.
Flowering and fruiting time: IV–VI.
Distribution: N to W Iran. Map 8.

Specimens seen:

Iran. Prov. Tehran: S. Tehran, Bibishehr Banu mt., 1350 m, 24.6.1973, *Babakhanlu & Amin 15215* (W). – Prov. Gilan: Manjil to Zanjan, Badamestan, 2000 m, 31.5.1971, *Iranshahr 41035* (W) – Kallaj-e-Manjil, 1000 m, 22.5.1973, *Sabei 15785* (W). – Prov E Azarbaijan: In agris derelictis ad meridiem jugi Goja Bel, 1650 m, 29.5.1971, *Rechinger 40956* (W). – Prov. Zanjan: inter Mianeh et Sengan, inter Agh-Kent et Bagh, 7.6.1859, *Bunge & Bienert* (P) – Benab to Chaftan, 1500–1950 m, 7.6.1977, *Moussavi & Tehrani 36801* (W) – Kuh Anguran: In declivibus borealibus jugi Tarom inter Manjil et Zanjan, 2000 m, 31.5.1971, *Lamond & Iranshahr 41106* (W) – Kuh Anguran, 35–42 km SW Tashvir, inter Manjil et Zanjan, 1900–2200 m, 2.6.1971, *Lamond & Iranshahr 40909* (W) – Manjil to Zanjan, Tarom pass, 2100 m, 2.6.1971, *Lamond & Iranshahr 3600* (M) – Kallaj-e-Manjil, 1000 m, 22.5.1973, *Sabei 15785* (W) – 44 km from Gilvan, road to Zanjan, 2100 m, 18.6.1991, *Akhani 7294* (MSB). – Prov. Hamadan: Hamadan, montes Karagan, VI.1899, *Strauss* (B) – montes Tefresch, 1897, *Strauss* (B) – Abgarm-Avaj, road of Mahmudabad, 1450 m, 14.5.1974, *Dini & Bazargan 8677* (W).

A. rubrostriatus is closely related to *A. sciureus*, but differs from it mainly in having soon inflating calyces. The stipules and the leaves of the latter are also mostly much longer than in *A. rubrostriatus*. *A. sciureus* is much robuster than *A. rubrostriatus* and has often very long flowering part of inflorescence.

18. ***Astragalus sciureus*** Boiss. & Hohen. in Boiss., Diagn. Pl. Or. Nov. 9: 98. 1849 ≡ *Tragacantha sciurea* (Boiss.) Kuntze, Revis. Gen. 2: 948. 1891. **Holotype**: ad Gattade vallis Talagon montis Elbrus, 14.7.1843, *Kotschy 520* (G-BOIS!; Iso: G!, GOET!, H!, LE!, MSB!, P!, PRC!, TUB!, WAG!).

= *A. tenax* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 68. 1868 et l.c. 15 (1): 113. 1869 ≡ *Tragacantha tenax* (Bunge) Kuntze, Revis. Gen. 2: 948. 1891. Holotype: Iran, Prov. Zanjan, inter Teheran et Tabris, inter Chorum-derreh et Sultanieh, 6.6.1859, *Bunge & Bienert* (P!, G-BOIS!).

= *A. sciureus* Boiss. & Hohen. var. *subsessilis* Bornm., Bull. Herb. Boiss., sér. 2, 5: 765. 1905. Holotype: In planitiei Saudsch-Bulag inter Agababa et Kaswin, 1300–1400 m, 13.5.1902, *Bornmüller 6874* (B!: cum diagnosi: foto MSB!; Iso: JE!).

Fig. 2c

Plants 15–40 cm high, up to 70 cm including inflorescence. Hairs 0.1–1.5 mm, on peduncles sometimes up to 3 mm and on the calyx up to 6 mm long, thin. Stems mostly ascending, up to 20 cm long, growing 1.5–5 cm per year, in first year 2–5 mm in diameter. Stipules thinly membranaceous, hyaline, whitish to yellow, with 5–8 parallel nerves at free portion, 15–27 mm long, at a length of 7–15 mm adnate to the petiole, otherwise 4–9 mm connate, triangular-acuminate, wholly glabrous or only ciliate at margins. Leaves 3–16 cm long; rachides ± dense, often rigid and thick, straight, obliquely erect to horizontal or curved, rarely deflexed, densely covered with appressed to subappressed or rarely spreading hairs; petiole 1/5–1/3 the length of the rachid; end-thorn 1/10–1/5(–2/3) the length of the uppermost leaflets; leaflets in 3–10 pairs, whitish green, ± remote, 9–32 mm long and 2.5–5 mm wide, mostly flattened, linear to narrowly oblong-elliptic, acute, with a mucro up to 1.5(–2) mm long, both sides densely covered with appressed or rarely spreading hairs. Inflorescence overtopping the leaves; flowering part lax, (7–)13–25 cm long and 1.5–2.5(–3.5) cm wide, long cylindrical; peduncle shorter or rarely longer than leaves, 4–30 cm long, densely to sparsely covered with short appressed thin hairs up to 1.5 mm long and beside them with some subappressed thicker hairs up to 3.5 mm long, sometimes densely villose. Bracts thickly membranaceous, not hyaline or only so at margins, yellowish, mostly with purple tip, 10–18 mm long and 3–8 mm wide, lanceolate-elliptic, long acuminate, wholly glabrous or rarely sparsely pilose at the apex and midrib. Calyx pale yellow or creamy with purple nerves and teeth, sometimes the tube in upper part or wholly purple, 12–24 mm long and 4–6 mm wide, tubular, with 17–25 parallel nerves, densely long appressed hairy becoming densely villose; teeth 5–11 mm long. Corolla limb pink to red or light purple. Standard 16–26 mm long; limb 9–17 mm long and 5–9.5 mm wide, obovate or obovate-panduriform, rounded or slightly retuse at the apex, minutely mucronulate, hastate-auriculate at base; claw 5–9 mm long, cuneate. Wings 15–23.5 mm long; limbs 6.5–12 mm long and 2.5–3 mm wide, narrowly oblong, sometimes slightly expanded in upper part, obtuse or obliquely acute at tip; auricle 0.3–0.6 mm long; claw 9–12 mm long. Keel 14–20 mm long; limbs 5–6.5 mm long and 2.5–3.5 mm deep, obovate-triangular, with narrowly curved lower edge and ± concave upper edge, obtuse, minutely mucronulate; claw 9–15 mm long. Stamens at upper 4–5 mm free from each other. Fruit 7–8 mm long, 1.5–2 mm

high and 3–4 mm wide. Seeds light to dark brown, 3.5–4.5 mm long, 2.5–2.8 mm wide, elliptic-reniform, ± flattened, pitted.
Flowering and fruiting time: (V–)VI–VIII.
Distribution: N-Iran. Map 8.

Specimens seen:

Iran. Prov. Tehran: Kondar, 35 km NE Karaj, 2000 m, 25.6.1974, *Amin & Bazargan 19325, 19326* (W) – m. Elburs occid., inter Getschesar et Asadbar, 2500 m, 19.6.1902, *J. et A. Bornmüller 6875* (B) – ad Gattade vallis Talagon montis Elbrus, 14.7.1843, *Kotschy 520* (G, G–BOIS, GOET, H, LE, MSB, P, PRC! TUB, WAG) – m. Elburs, in valle Talekan, supra Dschoistan, 2100 m, 27.6.1902, *J. et A. Bornmüller 6876* (B) – In districtu Talekan ad pagum Deda, 2350 m, 1.7.1902, *J. et A. Bornmüller 6878* (B) – In valle Talekan ad Gattadeh, 2300 m, 27.6.1902, *J. et A. Bornmüller 6879* (B, P, W) – Talagan, 2080 m, 14.7.1972, *Foroughian 16058* (W) – Talegan mts, 2500 m, 16.7.1972, *Foroughian 15474* (W) – Karaj-Chalus, Sirachal, 1900 m, 30.7.1973, *Amin 14986* (W) – Keredj, Kuh Daschteh, 2400–2600 m, 9.7.1934, *Gauba 30* (B) – Gatchsar to Gadjereh, Dizine, 2400–2600 m, 12.7.1977, *Termeh & Matin 36734* (W) – Zentral-Elburs: am südabhang des Totschal im Tal Häfthous nordwestlich von Teheran, 1300–1500 m, 4.7.1948, *Aellen 1018* (W). – Prov. Zanjan: Zanjan to Qazvin, Asad Abad, 1950 m, 11.7.1972, *Foroughian 15546* (W) – 8 km a pago Ziaran (c. 50 km E ab oppido Qazvin, 11.7.1977, *Sojak 7710* (PR) – Qazvin, Atanak, 2060 m, 26.6.1972, *Foroughian & Hariri 15362* (W) – In planitiei Saudsch-Bulag inter Agababa et Kaswin, 1300–1400 m, 13.5.1902, *Bornmüller 6874* (B, JE) – Aqqbaba, road of Rasht-Qazvin, 2000 m, 12.7.1972, *Foroughian & Hariri 15803* (W) – inter Teheran et Tabris, inter Chorum-derreh et Sultanieh, 6.6.1859, *Bunge & Bienert* (G–BOIS, P) – Not to localize: In Thale des Kischlakh-rud ad mont. Perinosch-chaue, 28.5.1906, *Strauss* (B).

A very long inflorescence is the most conspicuous character of this species. Moreover, the not or only slightly inflated fruiting calyx make it distinguishable from other species of the section with long inflorescences. Some specimens of *A. sciureus*, which approach the type of *A. tenax* have shorter and ± dense inflorescence. These specimens can be confused with *A. persicus* by mistake. However, the not inflating calyx is a good character here to prevent any error.

Var. *subsessilis* is only an immature specimen of *A. sciureus*. See also the note under *A. rubrostriatus*.

19. ***Astragalus straussii*** Bornm., Beih. Bot. Centralbl. 19(2): 234. 1906. Syntypes: Sultanabad, inter Girdu et Nesmabad, 2.6.1889, *Strauss* (JE!); dit. urbis Sultanabad, in monte Schahsinde, VI.1897, *Strauss*; in monte Raswend, V.1896, *Strauss* (B!); Burudschird, V.1898, *Strauss* (B!, JE!); Hamadan, monte Karagan, VII.1889, *Strauss* (JE!). **Lectotype** (designated here): dit. urbis Sultanabad, in monte Schahsinde, VI.1897, *Strauss* (B!: foto MSB!; Iso: BRNM!, JE!).
= *A. straussii* Bornm. var. *albiflorus* Bornm., Beih. Bot. Centralbl. 19(2): 234. 1906. Holotype: In monte Raswend, V.1896, *Strauss* (B!).

Fig. 1c

Plants 20–35 cm high. Hairs 0.1–1 mm, on peduncles and calyx up to 3.5 mm long. Stems mostly ascending, up to 20 cm long, growing 1.5–5 cm per year, in first year 2–5 mm in diameter. Stipules thinly membranaceous, hyaline at free portion, whitish to yellow, with 8–13 parallel nerves at free portion, 12–23 mm long, at a length of 7–10 mm adnate to the petiole, otherwise 1–3 mm connate, triangular-acuminate, wholly

glabrous or ciliate at margin. Leaves 2.3–8.5 cm long; rachides ± remote, often rigid and thick, mostly curved, obliquely erect to horizontal or rarely deflexed, densely or sparsely covered with appressed to subappressed or rarely spreading hairs; petiole 1/5–1/3 the length of the rachid; end-thorn 1/5–1/2 the length of the uppermost leaflets; leaflets in 3–7 pairs, greyish-green, ± remote, 4–30 mm long and 1.5–5 mm wide, mostly flattened, linear to narrowly elliptic, acute, with a mucro up to 2 mm long, both sides densely covered with short appressed or sometimes spreading hairs. Inflorescence dense, overtopping the leaves; flowering part 3–4 cm long and 1.5–3 cm in diameter, globose to ovate; peduncle 3–8.5 cm long, often longer than the leaves, densely villose, later on glabrescent. Bracts thickly membranaceous, at margins hyaline, yellowish, sometimes with purple tip, 8–15 mm long and 2.5–5 mm wide, ovate to oblong-elliptic, long or shortly acuminate, glabrous or rarely ciliate. Calyx whitish to creamy with purple nerves and teeth, sometimes the tube in upper part or wholly purple, 12–24 mm long, 4–6 mm wide at flowering time and 5–8 mm at fruiting time, at first tubular, then ovate-elliptically inflated, with 17–25 parallel nerves, densely covered with long appressed hairs becoming densely to sparsely villose; teeth 4–11 mm long. Corolla limb pink to red or light purple. Standard 16–27 mm long; limb 9–17 mm long and 5–8.5 mm wide in upper part and 5.5–9.5 mm wide at the base, ovate-panduriform, rounded at the apex or slightly retuse, minutely mucronulate, hastate-auriculate at base; claw 5–9 mm long, cuneate. Wings 15–23.5 mm long; limbs 6.5–12 mm long and 2.5–3 mm wide, narrowly oblong, sometimes slightly enlarged in upper part, obtuse or obliquely acute at tip; auricle 0.3–0.6 mm long; claw 9–12 mm long. Keel 14–20 mm long; limbs 5–6.5 mm long and 2.5–3.5 mm deep, obovate-triangular, with narrowly curved lower edge and ± concave upper edge, obtuse, minutely mucronulate; claw 9–15 mm long. Stamens at upper 4–5 mm free from each other. Fruit 7–8 mm long, 1.5–2 mm high and 3–4 mm wide. Seeds light to dark brown, 3.5–4.5 mm long, and 2.5–2.8 mm wide, elliptic-reniform, ± flattened, pitted.
Flowering and fruiting time: (V–)VI–VIII.
Ditribution: Iran. Map 9.

Specimens seen:

Iran. Prov. Tehran: Karaj, Shahdasht, Palangabad, 1250 m, 11.5.1974, *Dini & Bazargan 8377* (W) – Hezar Darreh, Tehran-Abali, 1600 m, 27.5.1972, *Dini & Arazm 15748* (W) – Sad-e Latyan, 1750 m and 1900 m, 7.5.1972, *Dini 15001, 15855* (W) – Road of Firuzkuh, Seyyedabad, 2500 m, 4.6.1972, *Dini & Arazm 15739* (W). – Prov. Markazi: In monte Raswend, V.1896, *Strauss* (B) – In dit. urb. Sultanabad, Schahzinde in montibus, V./VI. 1897, *Strauss* (B, BRNM, JE) – In m. Kuh-i-Sefidchane, *Strauss* 12.6.1904 (B, W), VII.1903 (B) – In m. Elwend-Gulpaigan, 30.5.1908, *Strauss* (B) – In m. Kuh. Gasawend, 1.7.1909, *Strauss* (B, W) – In m. Kuh-Besri, 4.6.1910, *Strauss* (B). – Prov.Hammadan: In montibus Karagan, V.1902, *Strauss* (B) – dito VII.1889, *Strauss* (JE) – Prov. Lorestan: Burudschird, V.1898, *Strauss* (B, JE) - Prov. Esfahan: S Khunsar, Kuh Sial, 2600 m, 17.5.1973, *Babakhanlu & Amin 15646* (W).

Together with *A. chehreganii* it forms an ± isolated group. Long standard and wing limbs, broad inflorescence and relatively shortly hairy calyx characterize the species.

See also the note under *A. chehreganii*.

20. ***Astragalus tabrizianus*** Fisch., Bull. Soc. Imp. Naturalistes Moscou 26(2): 445. 1853 ≡ *Tragacantha tabriziana* (Fisch.) Kuntze, Revis. Gen. 2: 948. 1891. Syntypes: ad Dshehan nameh, *Bode* (LE!); in promontoriis jugi Sahend, 22.6.1847, *Buhse*. **Lectotype** (PODLECH & SYTIN, here designated): [Aorbange] in promontoriis jugi Sahend, 22.6.1847, *Buhse* [*627*] (LE!; Iso: G-BOIS!, M!, P!)

= *A. cordatus* Bunge, Mém. Acad. Imp. Sci. Saint Pétersbourg 11(16): 69. 1868 et l.c. 15(1): 114. 1869 ≡ *Tragacantha cordata* (Bunge) Kuntze, Revis. Gen. 2: 944. 1891. Holotype: inter Teheran et Tabris, [inter Aghkent et Mianeh], VI.1859, *Bunge & Bienert* (P!; Iso: G-BOIS!)

Fig. 5a

Plants 15–25 cm high. Hairs 0.1–3 mm, on calyx up to 4(–5) mm long, mostly thin. Stems prostrate to ascending, up to 12(–17) cm long, growing 0.5–4 cm per year, in first year 1–3 mm in diameter. Stipules chartaceous, yellowish, with 1–3 parallel nerves at free part, 8–15(–18) mm long, at a length of 4–8(–10) mm adnate to the petiole, otherwise 1.5–5 mm connate, ovate to lanceolate, acuminate, glabrous, younger ones sometimes sparsely appressed pilose, ciliate or not. Leaves 1–15 cm long; rachides dense, rigid, thick, straight, oblique to subhorizontal, rarely curved, densely to sparsely covered with appressed to semi-appresed hairs, or becoming glabrous; petiole 1/5–1/3 the length of the rachid; end-thorn 1/10–2 times as long as the uppermost leaflets; leaflets in (2–)3–9 pairs, remote, silvery to light green, complicate or rarely flattened, 6–22 mm long and 1.5–4 mm wide, linear to narrowly elliptic, acute, with a mucro up to 2 mm long, both sides densely sericeous. Inflorescence not higher than the leaves, ± dense, 4–8 cm long and 3–3.5 mm wide; peduncle 0.5–9 cm long, densely villose. Bracts chartaceous, yellowish, rarely red at tip, 8–20 mm long and 4–9 mm wide, very broadly to lanceolate-elliptic, long acuminate, densely appressed pilose, or at least hairy on midrib. Calyx whitish or creamy, purple at the teeth, at first tubular, later on ovate-elliptically inflated, 11–17 mm long and 4–10 mm wide, with 20–30 parallel nerves, densely appressed hairy becoming sparsely villose; teeth 5–8(–12) mm long. Corolla limb pink to dark purple. Standard 13–18 mm long; limb 7.5–12 mm long and 4–7 mm wide, oblong-panduriform, obtuse or rarely retuse at tip, minutely mucronulate, acutely hastate at base; claw 4–8 mm long, broadly cuneate. Wings 13–17 mm long; limbs 6–7 mm long and 2–2.5 mm wide, narrowly oblong, sometimes somewhat broader in upper third, obtuse; auricle 0.3–0.6 mm long; claw 7.5–10.5 mm long. Keel 11.5–15 mm long; limbs c. 5 mm long and 2–3 mm deep, obovate-triangular, with almost rectangular curved lower edge and straight or ± convex upper edge, obtuse, minutely mucronulate; auricle tiny; claw 7.5–10 mm long. Stamens at upper 3–5 mm free from each other. Fruit 7–9 mm long, c. 2 mm high and 2.5–4 mm wide. Seeds olive-green to dark brown, 3–4 mm long and 2–2.8 mm wide, elliptic, at first smooth becoming rugose.
Flowering and fruiting time: VI–VIII.
Distribution: NW and W Iran. Map 9.

Specimens seen:

Iran. Prov. W. Azarbaijan: Rezaieh, Ashk Island, 1300–1400 m, 20.6.1977, *Moussavi & Zargani 36814* (W) – Rezaiyeh, Ile de Kaboudan, 1300–1600 m, 4.6.1978, *Matine & Daneshpajouh 38379* (W) – dto., 18.6.1977, *Moussavi & Zargani 36806* (W) – Rezaiyeh lake, Espire island, 1330 m, 2.6.1974, *Wendelbo, et al.* (LE, W). – Prov. E Azarbaijan: 20 km S of Marand, forest near water, 1900 m, 28.6.1969, *Andersen & Petersen 76* (K, W) – Tabriz to Marand, 18 km S Marand, 1500 m, 27.7.1971, *Termeh 40937* (W) – In monte Mishab Dagh prope Yam, 1800–2400 m, 29.7.1971, *Termeh 43913* (W) – ad Dshehan nameh, *Bode* (LE) –

in promontoriis jugi Sahend, 22.6.1847, *Buhse*.(G-BOIS, LE, M, P) – Bostan-abad, Atmish-alti, Damaneh-ye Sahand, 2620 m, 3.8.1984, *Termeh & Moussavi 41388* (W). – inter Teheran et Tabris, [inter Aghkent et Mianeh], VI.1859, *Bunge & Bienert* (G-BOIS, P) – Prov. Kermanshah: volcanic hillside at Dinard, 40 km from Bistoon, 80 km NE of Kermanshah, 26.6.1965, *Ledingham, Bonvan et al. 4212* (W) – Dry hillside of volcanic ash, 3 km of Harsin, 60 km E Kermanshah, 26.6.1965, *Ledingham, Zohary, Bonvan et al. 4201* (W) – rocky volcanic mountain at Dinard, 80 km NE Kermanshah, 26.6.1965, *Ledingham, Bonvan, et al. 4213* (W) – Touiserkan to Kangavar, 1650–1750 m, 11.6.1959, *Pabot 12489* (W) – 5 km on the road from Dehlagh to Kangavar, between Sahneh and Songhor, 1710 m, 6.7.1994, *Chehregani & Zarre 17813* (MSB, TARI, TUH) – Tagh-e Bostan to Parrow mts., 10 km on the sandy road after military station, 1500–1600 m, 6.7.1994, *Chehregani & Zarre 17821* (MSB, TARI, TUH).

A. tabrizianus is closely related to *A. lagopoides*. It has sometimes also long acuminate bracts, which is the common feature of *A. lagopoides*. In contrast to *A. lagopoides*, *A. tabrizianus* has always inflorescences which are shorter than or as long as the leaves. Short inflorescences can also rarely be found in *A. lagopides*, then, however, they are spherical and short (2.5 cm in diameter). Moreover, the lower bracts of *A. tabrizianus* fall away easily at fruiting time, whereas they are persistent in *A. lagopoides*. See also the notes under *A. hirticalyx*, *A. lagopoides*, *A. hymenostegis* and *A. velenowskyi*.

The specimens from Prov. Kermanshah are different from typical *A. tabrizianus* in some aspects. For example they have leaflets strongly complicate and caducous bracts and flowers. Because of intermediate forms and no exact limitation we refrain from assigning any formal rank to them. This form was attributed to *A. laguriformis* by MAASSOUMI (1995).

21. *Astragalus uraniolimneus* Boiss., Fl. Or. 2: 380. 1872 ≡ *Tragacantha uraniolimnea* (Boiss.) Kuntze, Revis. gen. 2: 949. 1891. **Lectotype** (designated here): Armenia Rossia, mt. Alages et ad lacum Gocktschai, *Seidlitz* (G-BOIS!; Iso: G-BOIS!).
= *A. woronowii* Bornm., Vestn. Tiflissk. Bot. Sada 26: 1. 1912. Holotype: Prov. Batum, distr. Artvin, in monte Ekuter, 2200 m, 29.7.1911, *Woronow 5946* (B!; Iso: LE!).

Plants 10–20 cm high. Hairs 0.1–1.5 mm, on peduncle up to 3 mm and on calyx up to 4 mm long, crispate or straight. Stems ascending, up to 15 cm long, growing 1–4 cm per year, in first year 1–3 mm in diameter. Stipules thinly membranaceous, hyaline at free portion, yellowish white, with 1–3 parallel nerves at free portion, 8–16 mm long, at a length of 3–9 mm adnate to the petiole, otherwise 0.5–2 mm connate, triangular-acuminate, glabrous, ciliate. Leaves 0.7–4.5 cm long; rachides dense, ± thick, rigid, mostly straight, obliquely erect to subhorizontal, lower ones sometimes deflexed, densely or sparsely spreading hairy; petiole 1/3–1/2 the length of the rachid; end-thorn 1/5–1/2 the length of the uppermost leaflets; leaflets in 4–6 pairs, dense, grey-green, slightly complicate to flattened, 3–14 mm long and 1–2.5 mm wide, linear to narrowly oblong, acute, with a mucro of 0.2–1 mm long, both sides densely covered with appressed to subappressed hairs. Inflorescence overtopping or rarely as long as the leaves; flowering part dense, 3–5 cm long and 2–3 cm in diameter, short cylindrical or rarely globose; peduncle shorter or as long as the leaves, 2–5 cm long, densely to sparsely villose. Bracts thinly membranaceous, hyaline at margins, yellowish, mostly purple at tip, 8–12 cm long and 2.5–4 mm wide, ovate to lanceolate-elliptic, shortly acuminate, wholly glabrous or sparsely pilose at the apex and midrib, ciliate. Calyx creamy, red to purple in upper part or rarely allover, at first tubular, soon

globose-elliptically inflated, 12–16 mm long and 4–7 mm wide, with 12–17 parallel nerves, densely covered with appressed to subappressed long hairs becoming sparsely villose; teeth 5–7 mm long. Corolla limb pink or mauve to red. Standard 17–25 mm long; limb 12–17 mm long and 5–8 mm wide, oblong-panduriform, retuse at tip, hastate-angulate at the base; claw 4–5 mm long, broadly cuneate. Wings 14–22 mm long; limbs 6–8 mm long and 2–2.5 mm wide, narrowly oblong, obtuse; auricle 0.3–0.6 mm long; claw 7.5–9.5 mm long. Keel 12–17 mm long; limb 5–6 mm long and 2.5–3 mm deep, triangular-obovate, obtuse, minutely mucronulate; claw 7–9.5 mm long. Stamens at upper 3–4 mm free from each other. Fruit 4–6 mm long, 1.5–2 mm high and 2.5–3 mm wide. Seeds olive green to dark brown, 2.5–3.5 mm long and 2–2.5 mm wide, broadly elliptic to almost rounded, pitted.
Flowering and fruiting time: VI–VIII.
Distribution: Azerbaidzhan, Armenia, NW Iran. Map 9.

Specimens seen:

Azerbaidzhan. Prov. et distr. Gandzh, in mte. Karadagh, 12.7.1928, *Doluchanov* (LE) – ad lacum Gokza inter Semenocoka et Elenowka, 20.6.1901, *Fomin* (W) .

Armenia. Prov. Batum: distr. Artvin, in monte Ekuter, 2200 m, 29.7.1911, *Woronow 5946* (B, LE) – Armenia Rossia, mt. Alages et ad lacum Gocktschai, *Seidlitz* (G-BOIS) – Distr. Novo-Bajazet, in montibus supra pagum Shish-kaja, 7–10000 ft, 19.7.1928, *Grossheim* (LE) – Prope Shish-kaja, in faucibus, 9000 ft, 20.7.1928, *Shelkovnikov & Kara-Murza* (LE) – Novo-Bajazet, in jugo Shakh-dagh, prope p. Sultan-Ali-Kishlaki, 29.7.1928, *Zedelmejer & Gejdeman* (LE) – Distr. Novo-Bajazet, in jugo Artakhanoz, prope pagum Tzamakapert, 6800–8000 ft, 28.6.1928, *Zedelmeyer & Shelkovnikov* (LE) – Sevan: circa lac. Gokca, rip Günei, in declivibus prope Tochludja, 7600 ft, *Shelkovnikov & Kara-Murza* (LE) – Prov. Zangezur, circa p. Gedjalan fauc. Jaglu-dara, 30.7.1929, *Shelkovnikov & Kara-Murza* (LE) – Distr. Migri, inter Ketchmas et p. Tashtyn, in declivis meridionalis siccis, 2500 m, 20.8.1932, *Karjagin* (LE, ZT) – Promontoria Pambacensi supra lacum Sevan, 29.7.1939, *A.Fedorov* (LE) – Kaputdzhukh, Schabnoi, Zapadnii Verschini, 11.8.1950, *Gabrieshi* (W) – Montes Pambakski khrebet, in vicinitate oppidi Sevan, 1900–2200 m, 17.7.1975, *Vasak* (B, W) – Distr. Abrakunis ad limites Armeniae, 14.8.1940, *Karjagin* (LE) – P. Gedjalan fauc. Jaglu-dara, 30.7.1929, *Shelkovnikov & Kara-Murza* (LE) – In monte Sojuch supra Ordubad, 6–8000 ft, 27.5.1928, *Grossheim* (LE) – In jugo Zangezur, in monte Salvatry, 3000 m, 15.8.1927, *Gavrilov & Doluchanov* (LE).

Iran. Prov. W Azarbaijan: Khoi, Ghotour, 5.7.1955, *Sharif 2602* (W) – Kuh Kani Ziarat, N Habashi Bala, prope Qotur, 2300–3000 m, 18.7.1974, *Rechinger & Renz 49641* (W). – Prov. E Azarbaijan: Kalibar, Nabidjan, Kouhha-ye Doghroun, 2720 m, 26.6.1978, *Termeh et al. 38955* (W) – Ahar, Kuh Kalibar, 4.8.1968, *Termeh 133221* (W).

A. uraniolimneus is closely related to *A. hymenocystis* and *A. lagopodioides*. The dense inflorescence make it easily recognizeable from the remotely flowered *A. lagopodioides*. The inflorescence of *A. uraniolimneus* is mostly shortly cylindrical, but sometimes it may be globose. Specimens which show this character can be confused with *A. hymenocystis*. However, the latter possesses flexible and mostly curved rachides, in contrast to *A. uraniolimneus* with rigid and mostly straight ones.

The specimens cited as A. *uraniolimneus* by MAASSOUMI (1995) belong to A. *hymenocystis* subsp. *confiniorum*.

Short pedunculate forms of *A. uraniolimneus* have a similar habit as *A. hirticalyx*. However, in difference to *A. hirticalyx*, they have hyaline stipules and short standards.

22. ***Astragalus velenovskyi*** Nábelek, Spisy Prir. Fak. Masarykovy Univ. 35: 82. 1923. **Typus** (**HT**: sec. Fl. Turkey, BRNU, sed verosim. SAV): Kurdistania Turcia, distr. Hakkari, inter rivum Serkones et pag. Howaras, SE ab urbe Wan, 2.9.1910, *Nábelek 3108* (BRNU? SAV?).

Figures: NÁBELEK, Spisy Prir. Fak. Masarykovy Univ. 35: tab. 6, nr. 1. 1923.
Fig. 5c

Plants 20–30 cm high. Hairs 0.1–2 mm, on calyx up to 4 mm long, mostly thin. Stems ascending, up to 18 cm long, growing 0.5–5 cm per year, in first year 1–3 mm in diameter. Stipules chartaceous, not hyaline, yellowish, with 1–3 parallel nerves at free portion, 14–17 mm long, at a length of 8–11 mm adnate to the petiole, otherwise 2–4 mm connate, from a narrowly triangular base lanceolate-acuminate, younger ones densely appressed pilose, becoming glabrous, ciliate. Leaves 1.5–8 cm long; rachides dense, rigid, thick, older ones mostly broken, ± straight, obliquely erect to subhorizontal, densely shortly appressed hairy; petiole 1/4–1/2 the length of the rachid; end-thorn 1/6–1/2 the length of the uppermost leaflets; leaflets in 3–7 pairs, ± remote, greyish or silvery-green, 7–18 mm long and 1.5–3 mm wide, linear to narrowly oblong, complicate, acute, with a mucro up to 1.5 mm long, both sides densely to sparsely sericeous. Inflorescence shorter or as high, rarely somewhat higher than the leaves; flowering part ± dense, cylindrical or rarely ovate, 5–9 cm long and c. 2.5 cm wide; peduncle 0.5–2 cm long, shorter than the leaves, densely appressed pilose. Bracts chartaceous, not hyaline, yellowish, (8–)10–14 mm long and 4.5–9 mm wide, broadly ovate to lanceolate-elliptic, long acuminate, densely appressed hairy. Calyx whitish or creamy, at first tubular, becoming elliptically inflated, 13–15 mm long and 3.5–6 mm wide, with 13–23 parallel nerves, densely appressed villose; teeth 6–7 mm long. Corolla yellowish. Standard 14–17 mm long; limb c. 10 mm long and 5–6.5 mm wide, elliptic, minutely mucronulate at tip or obtuse, hastate at base; claw 4–6 mm long, broadly cuneate. Wings 13–16 mm long; limbs 6–7 mm long and 2–2.5 mm wide, narrowly oblong, obtuse; auricle 0.2–0.4 mm long; claw 7.5–9 mm long. Keel 12–15 mm long; limbs c. 5 mm long and 2.5 mm deep, obovate-triangular, with almost rectangular curved lower edge and straight or ± convex upper edge, obtuse or minutely mucronulate; claw 7–10 mm long. Stamens at upper 2.5–3.5 mm free from each other. Fruit and seeds unknown.
Distribution: E Turkey and NW Iran. Map 8.

Specimens seen:

Turkey. Prov. Agri: Agri to Hasiran, W Eleskirt, Weg nach Hayrangöl, 2650 m, 17.8.1987, *Engel 140* (MSB) – Aufstieg zum Ararat südseitig Dogubayazit, Ganikor, Ibrahimharo, Camp III, Araratgipfelzone, 3700 m, 13.–17.8.1969, *Albertshofer & Schauer* (M). – Prov. Van: Ercis to Delicay, weiter nach Pay Köyü, 2200 m, 14.8.1987, *Engel 131* (MSB) – Zab gorge S of Baskakle, 2.8.1954, *Davis & Polunin 23796* (PRC).

Iran. Prov. E Azarbaijan: 5 km E of Kandujan (= 33 km E of Khosroshah), on Sahand mountain-massif, semi-desert, 2900 m, 19.7.1964, *Grant 18, 283* (W).

A. velenowskyi is closely related to *A. lagopoides* and *A. tabrizianus*. It is different from *A. lagopoides* in having shorter peduncle, which make the whole inflorescence to be shorter than or maximally as long as the leaves and the bracts, which are scarcely as long as but mostly shorter than the calyx. It differs from *A. tabrizianus* in having yellow corolla and calyx teeth.

Doubtful species

A. demonstratus Maassoumi, Iran. J. Bot. 6(2): 204. 1995. Holotype: Zanjan, Mahneshan, ca. 10 km from Mahneshan to Pari, 2000 m, 24.5.1987, *Maassoumi et al. 64804* (TARI)

This newly described species has been collected in a region of Iran, of which we have only few material. Unfortunately the original description is incompelete, and the given sizes of flowers seem to be unrealistic. Such a wrong floral size has been cited also for *A. pedicularifomis*: The standard length were cited 18-24 mm, but we have analyzed more material as Maassoumi and couldn't find any standard longer as 18 mm. If the same is true for *A. demonstratus* too, and the real length of the standard is 18 mm (in the description ca. 23 mm), *A. demonstratus* would be a synonyme of *A. tabrizianus*. Howevere for final statement the study of the holotype is necessary.

Conclusion

New combination: Sect. *Hymenocoleus* Bunge to sect. *Hymenostegis* subsect. *Hymenocoleus.*

Transfers: *A. leucargyreus* Bornm. from sect. *Hymenostegis* to sect. *Acidodes* (= *A. stenolepis*). *A. mishoensis* Turill from sect. *Rhacophorus* (genus *Astracantha*) to sect. *Hymenostegis* (= *A. hirticalyx*).

Newly described Taxa: *Astraglus chehreganii* Zarre & Podlech. *Astragalus hymenocystis* Fisch. & C.A.Mey. subsp. *confiniorum* Zarre & Podlech.

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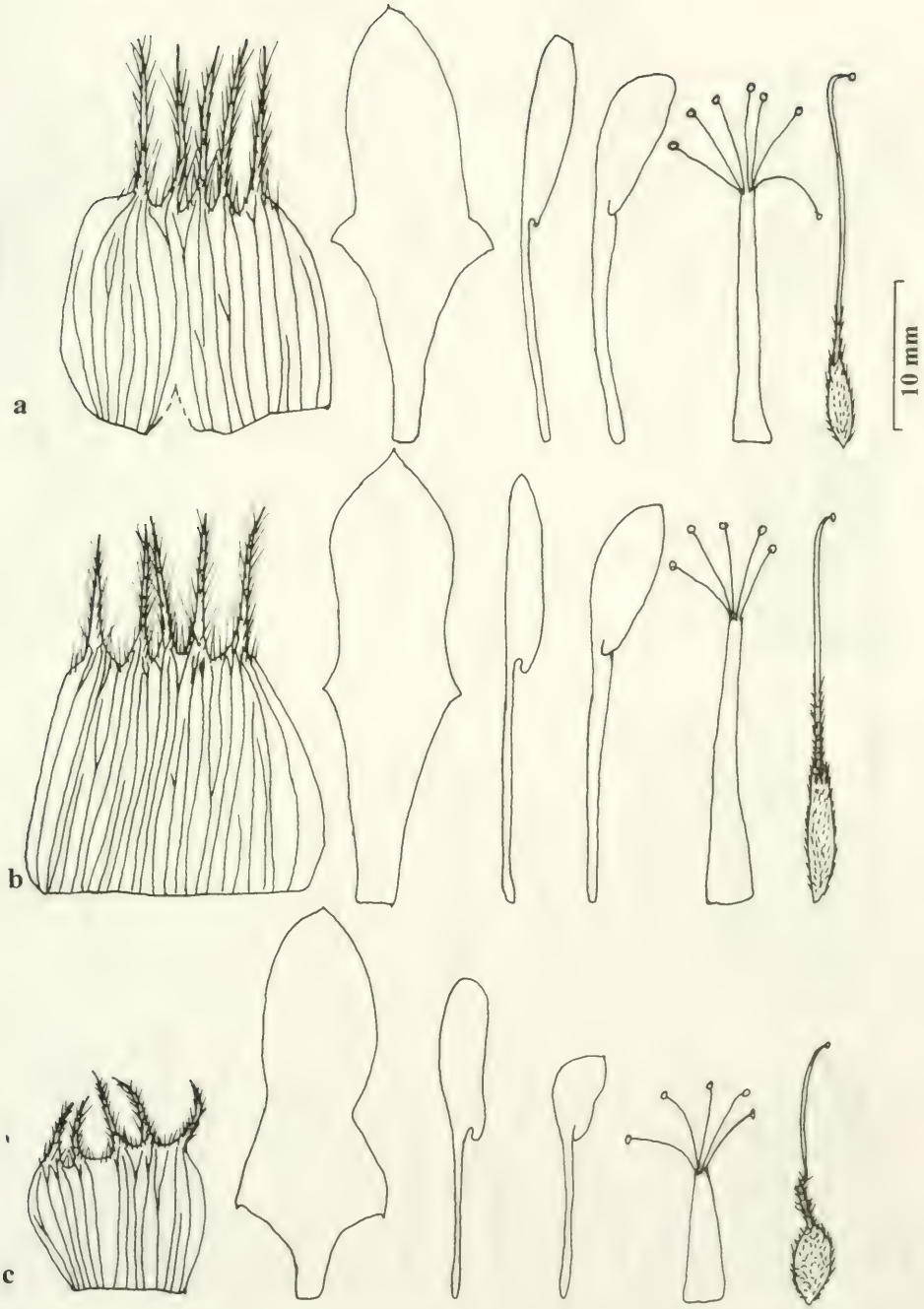


Fig. 1 a. *A. glumaceous*: *Rioux & Golvan 312* (W); b. *A. kohrudicus*: *Foroughi et al. 12468* (W); c. *A. strausii*: *Dini & Arazm 15748* (W).

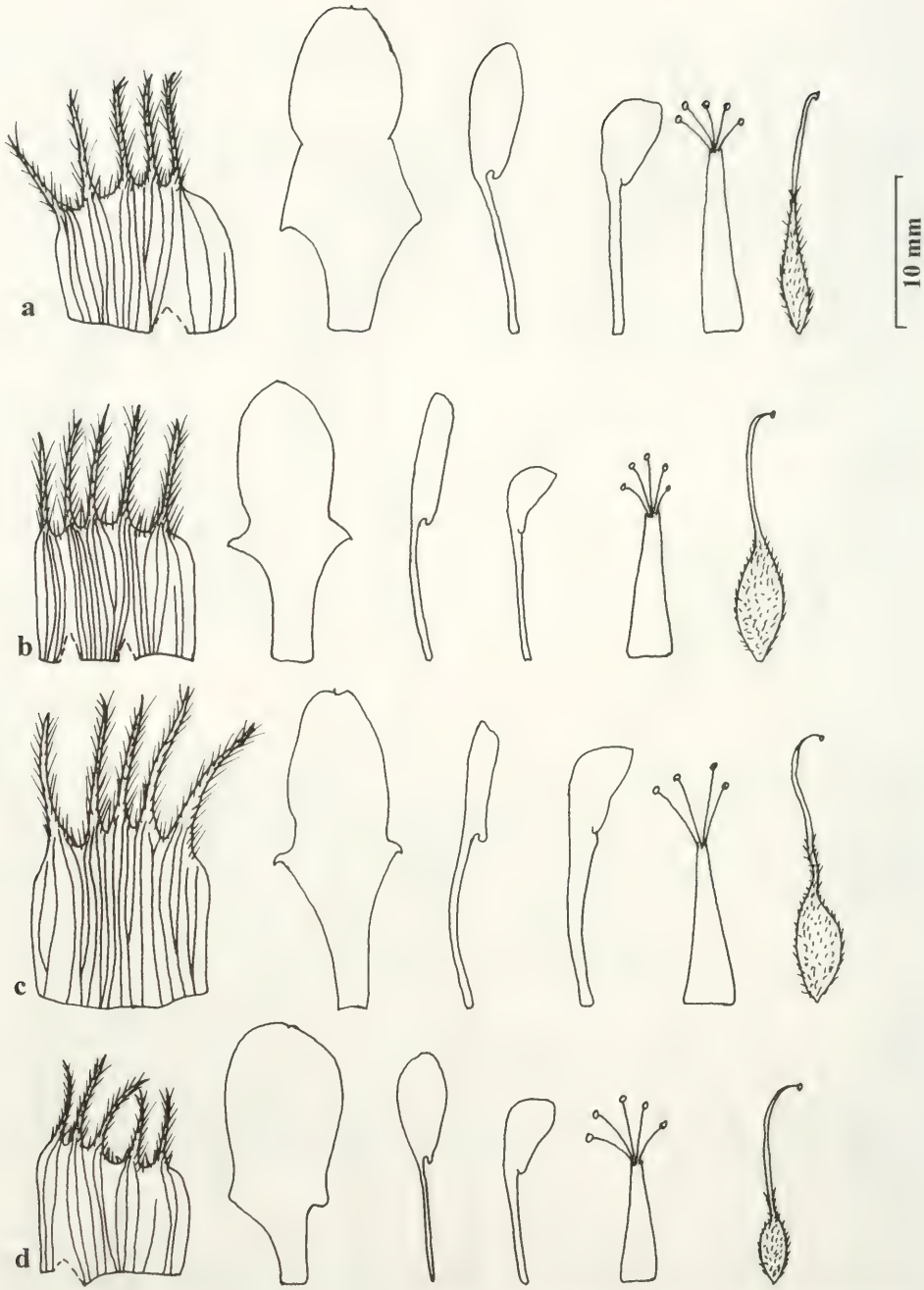


Fig. 2 a. *A. chehreganii*: *Rechinger 41877* (W); b. *A. nervistipulus*: *Rechinger 42914* (W); c. *A. sciureus*: *J. & A. Bornmüller 6879* (B); d. *A. rubrostriatus*: *Lamond & Iranshahr 40909* (W).

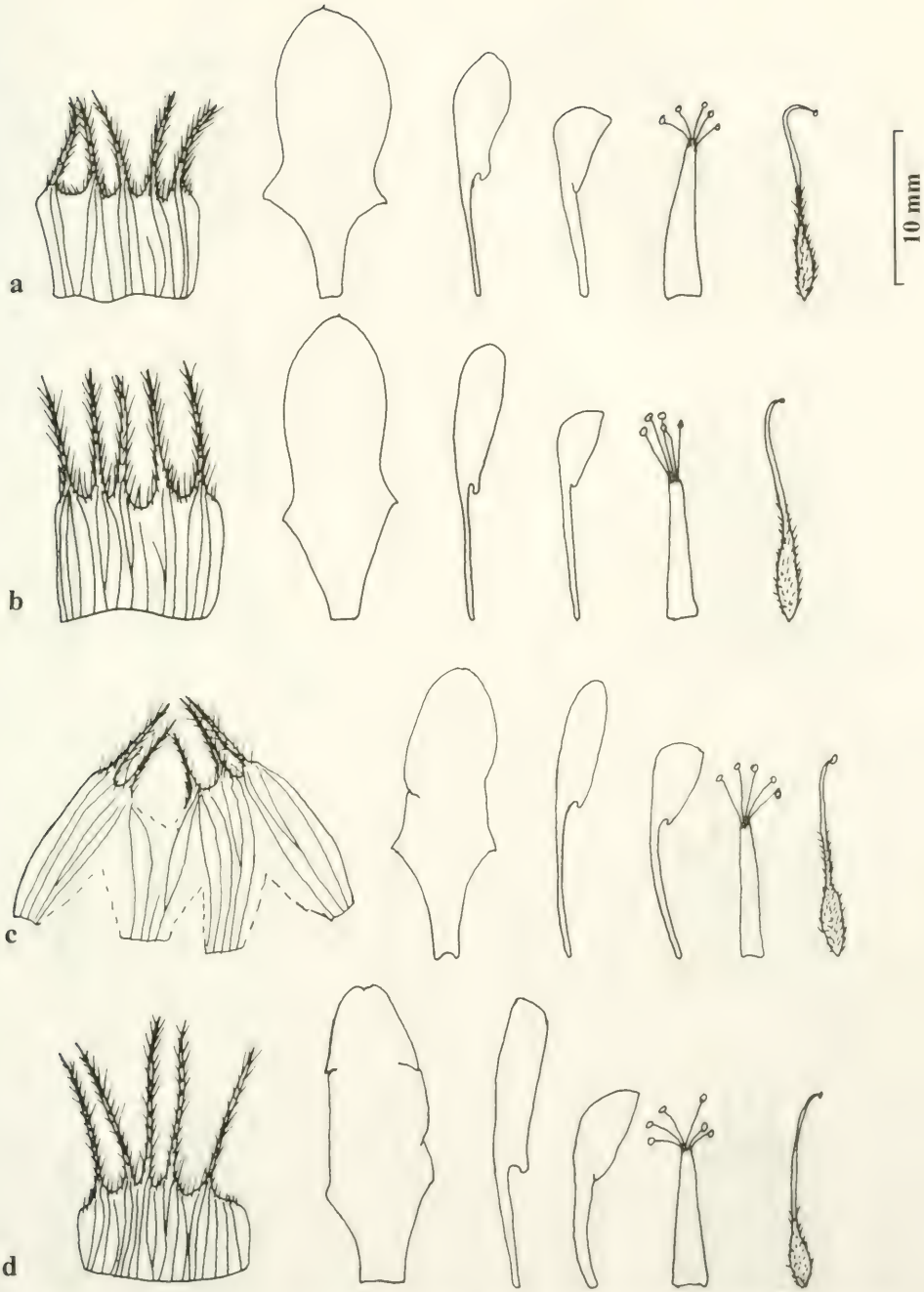


Fig. 3 a. *A. paralurges*: *Termeh 40928* (W); b. *A. lagopodioides Rix et al. 728* (M); c. *A. hymenocystis* subsp. *hymenocystis*: *Termeh 40999* (W); d. *A. hymenocystis* subsp. *confiniorum*: *W. Rechinger & Renz 48846a* (W)

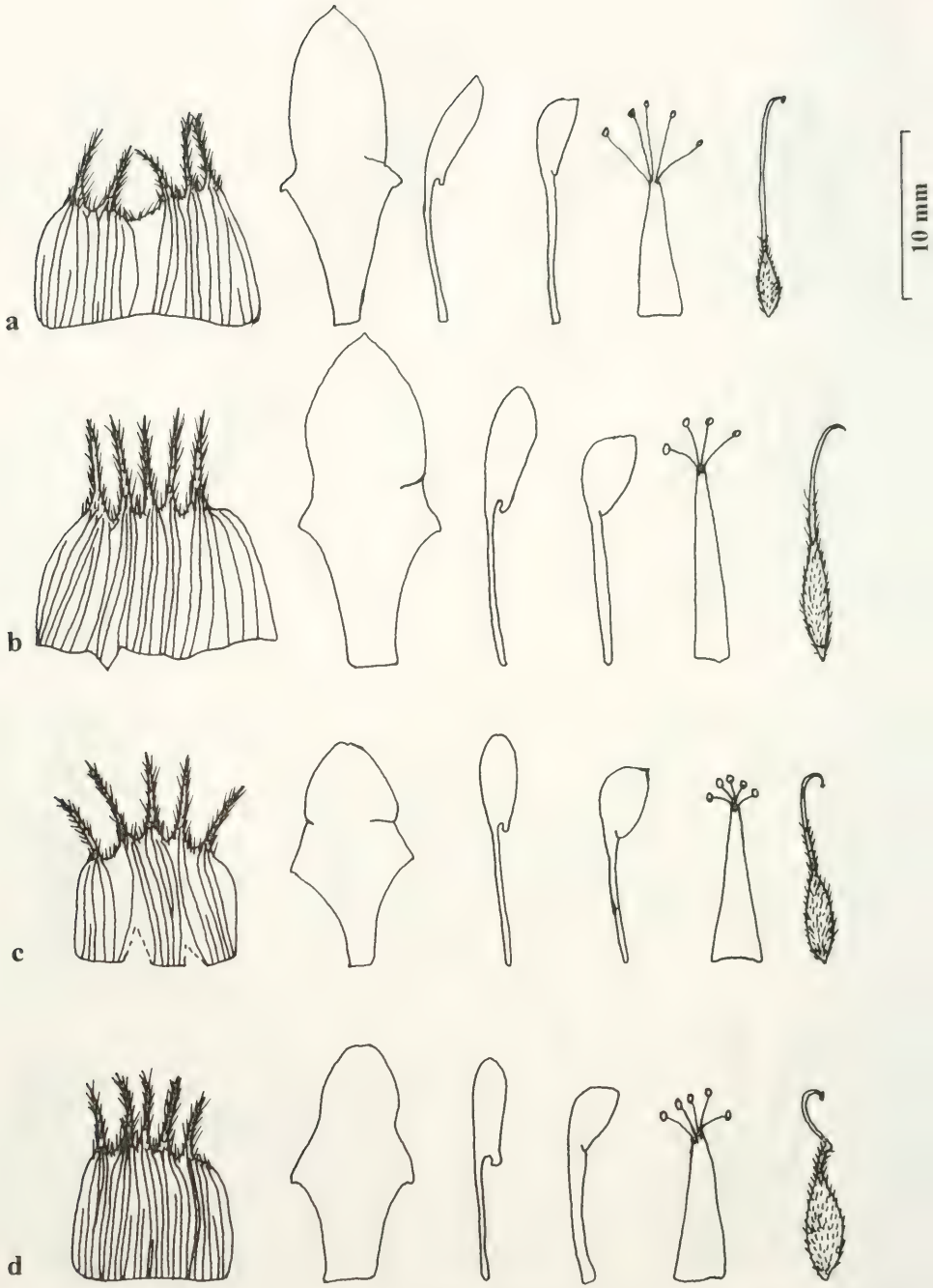


Fig. 4 a. *A. chrysostachys*: *Rechinger 40722* (W); b. *A. recognitus*: *Moussavi et al. 41074* (W); c. *A. lagopoides*: *Albertshofer* (MSB); d. *A. hymenostegis*: *Renz* (W).

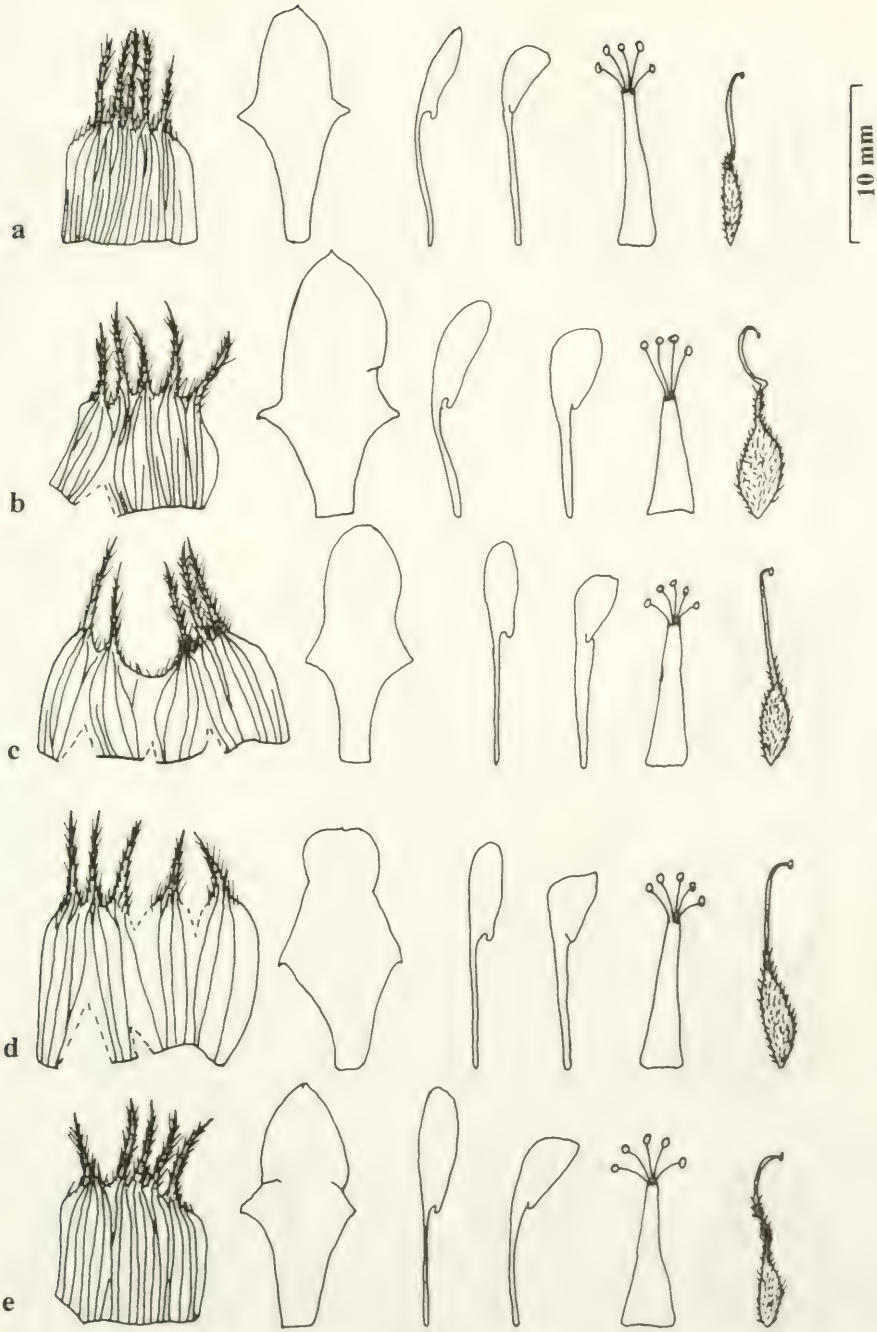


Fig. 5 a. *A. tabrizianus*: *Andersen & Petersen 76* (W); b. *A. pedicularifomis*: *Alava 14269* (TUR); c. *A. velenovskyi*: *Davis & Polunin D23796* (PRC); d. *A. laguriformis*: *Bornmüller 1194* (W); e. *A. hirticalyx*: *Brown 2116* (E).

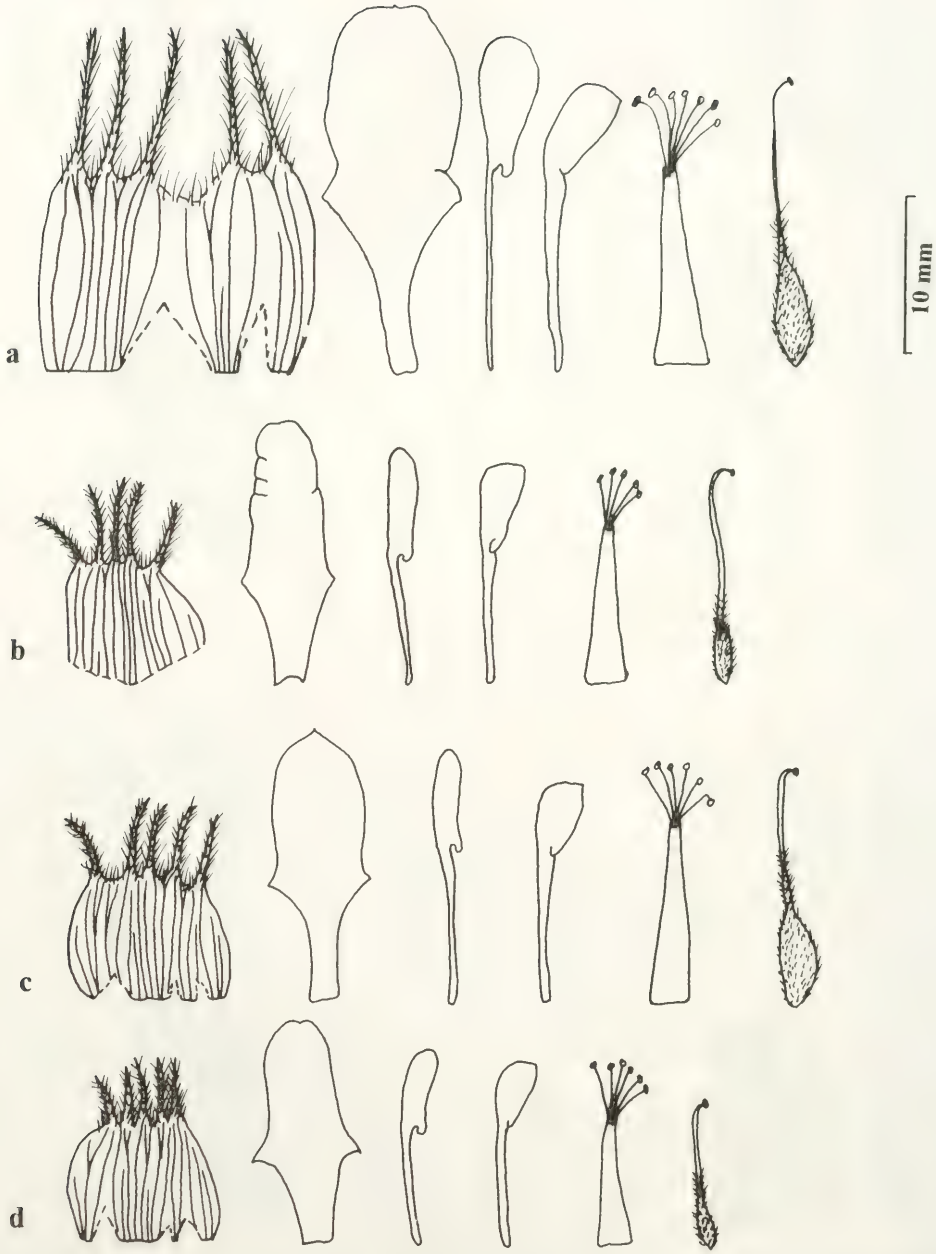
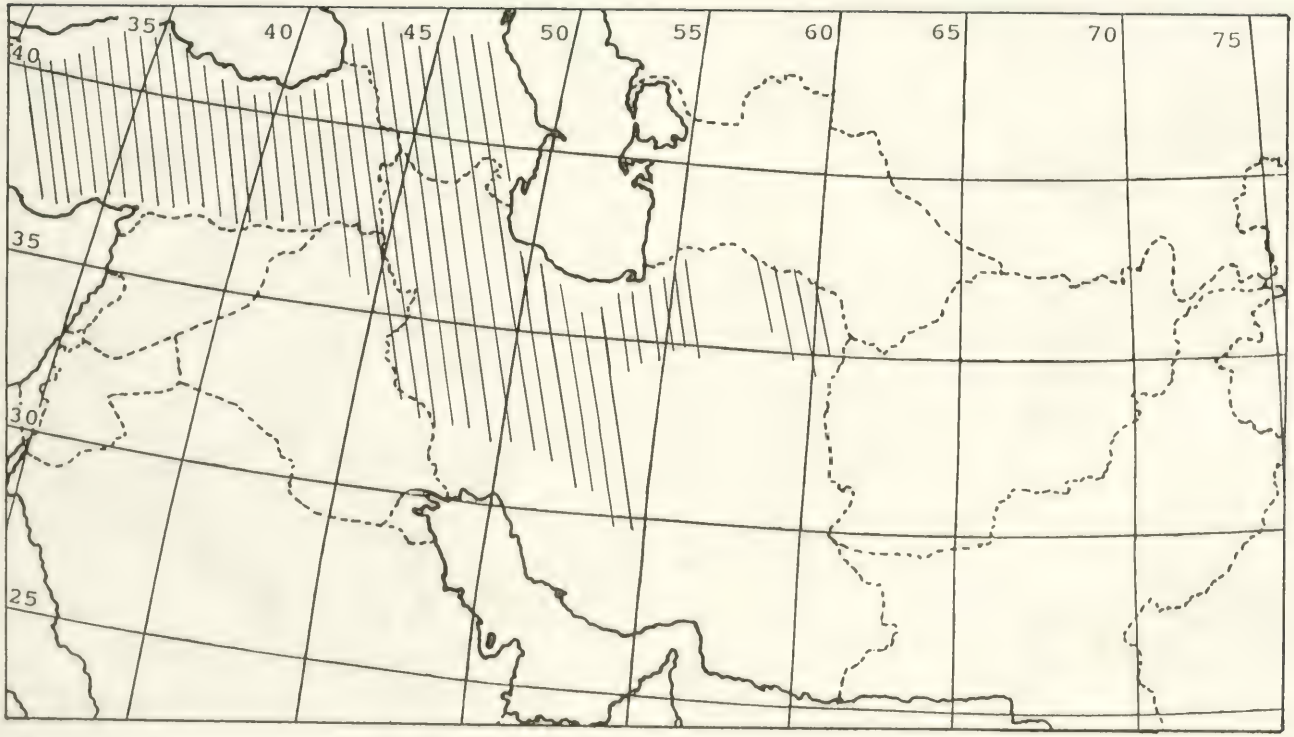
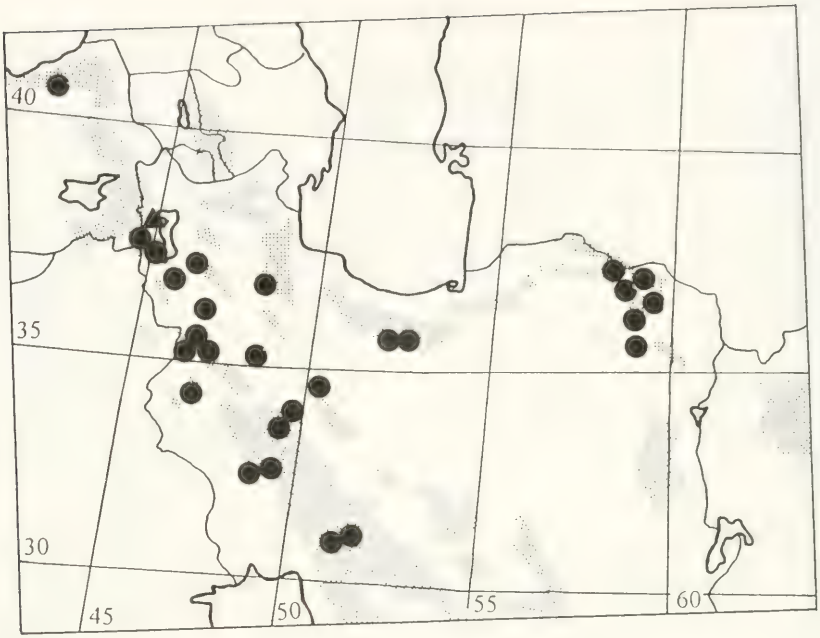


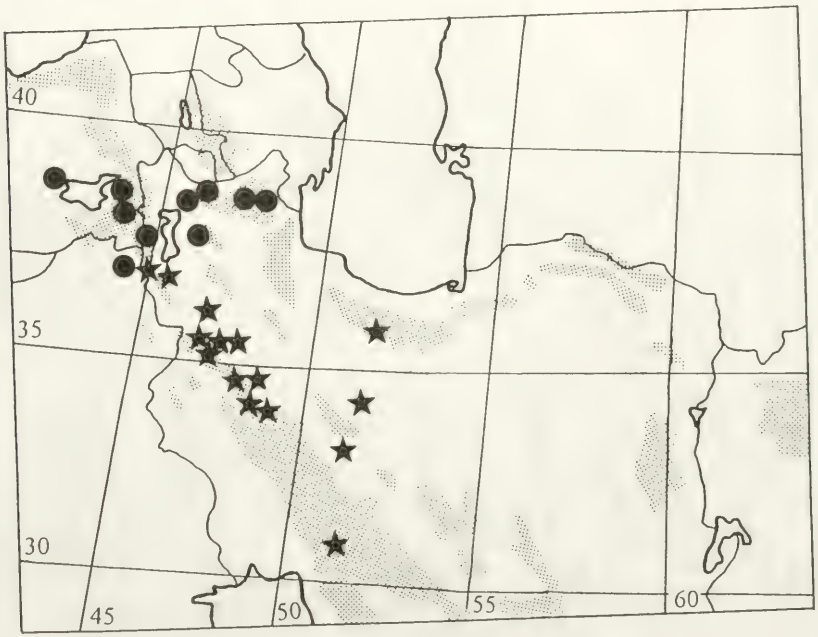
Fig. 6. *A. persicus*: a. *Gauba 543* (B); b. *Sojak 7763* (W); c. *Dini & Arazm 15707* (W); d. *Wendelbo & Assadi 13423* (W).



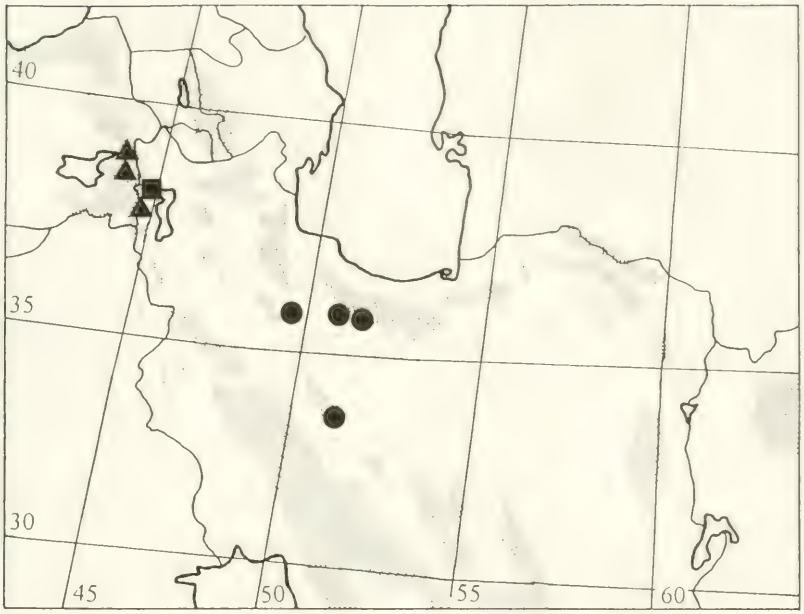
Map 1. Geographical distribution of the sect. *Hymenostegis*.



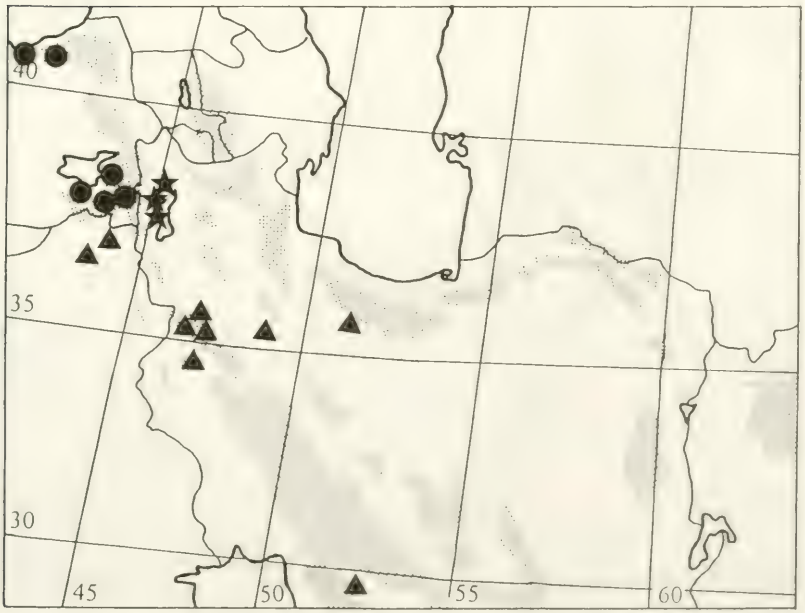
Map 2. ▲ *A. chehreganii*; ● *A. chrysostachys*.



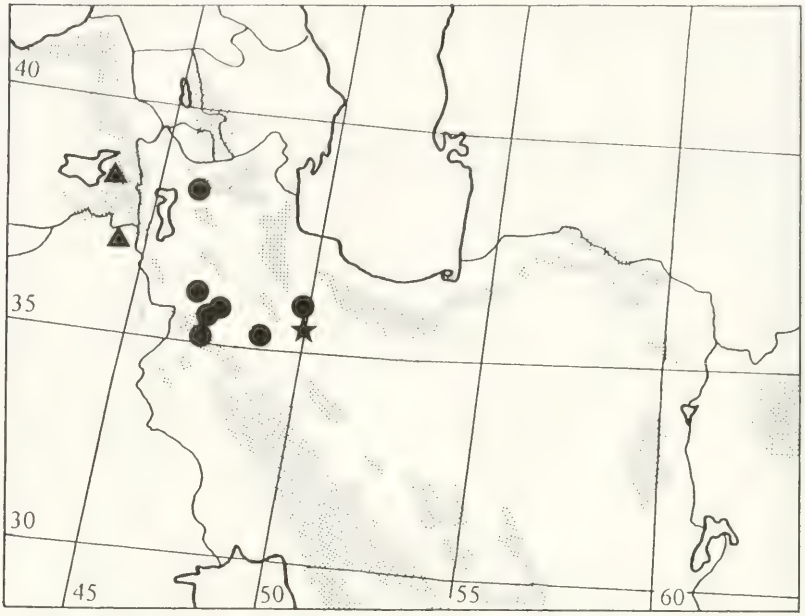
Map 3. ★ *A. glumaceous*; ● *A. hirticalyx*.



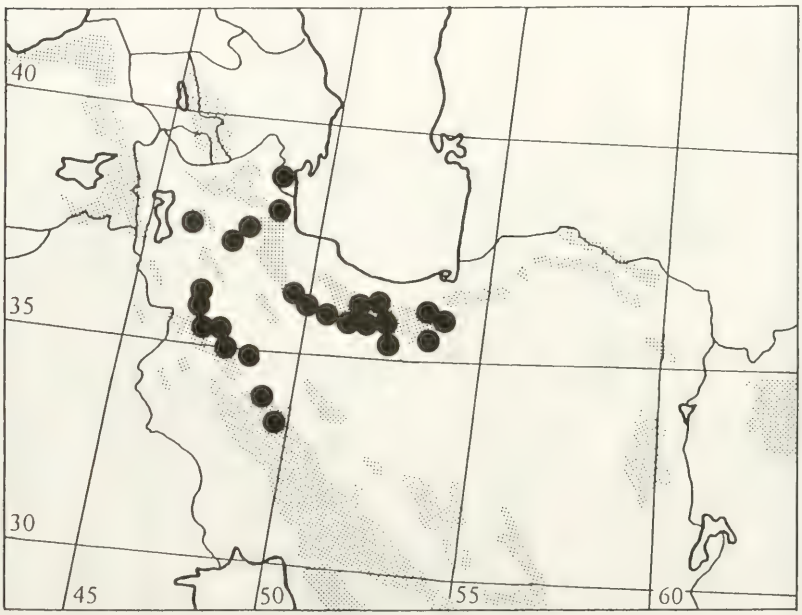
Map 4. ■ *A. hymenocystis* subsp. *hymenocystis*;
▲ *A. hymenocystis* subsp. *confiniorum*;
● *A. kohrudicus*.



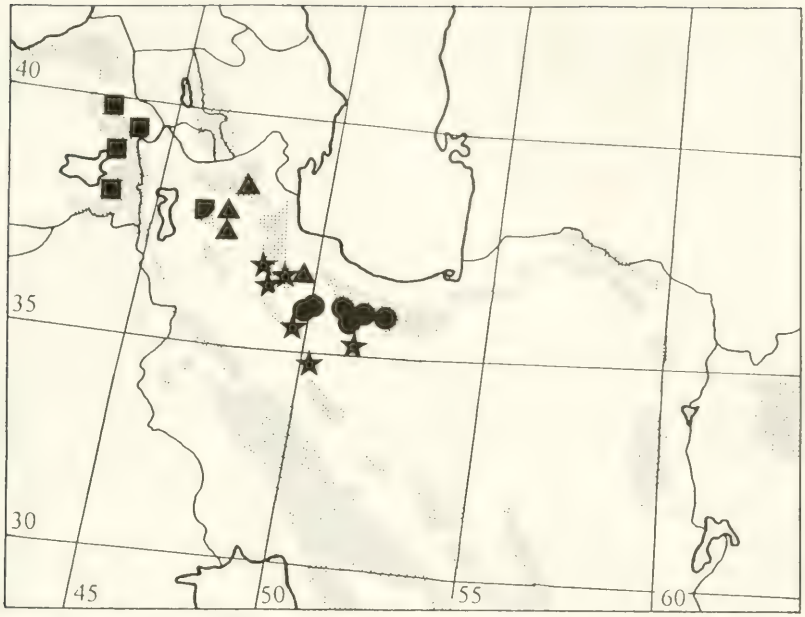
Map 5. ★ *A. hymenostegis*; ● *A. lagopodioides*; ▲ *A. nervistipulus*.



Map 6. ▲ *A. laguriformis*; ● *A. paralurges*; ★ *A. pedicilariformis*.

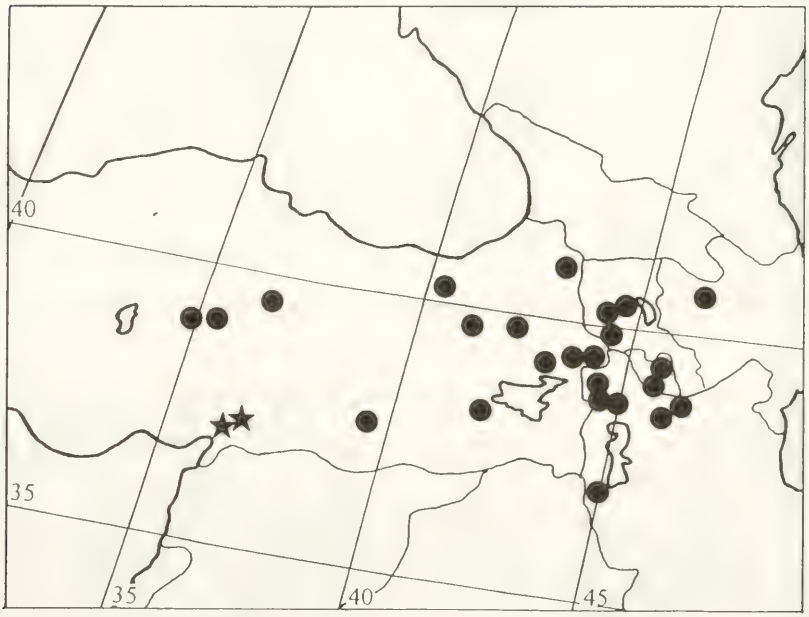


Map 7. ● *A. persicus*



Map 8. ▲ *A. recognitus*; ★ *A. rubrostriatus*; ● *A. sciureus*; ■ *A. velenovskyi*.

Map 9. ▲ *A. straussii*; ● *A. tabrizianus*; ★ *A. uraniolimneus*.



Map 10. ● *A. lagopodioides*; ★ *A. vaginans*.

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